

***United States Court of Appeals
for the Second Circuit***



EXHIBITS

United States Court of Appeals
FOR THE SECOND CIRCUIT

HELLENIC LINES LIMITED,

Plaintiff-Appellant,

—against—

LIFE INSURANCE CORPORATION OF INDIA,

Defendant-Appellee.

HELLENIC LINES LIMITED,

Plaintiff-Appellant,

—against—

AETNA CASUALTY & SURETY COMPANY, et al.,

Defendants-Appellees.

ON APPEAL FROM THE DISTRICT COURT OF THE UNITED STATES
FOR THE SOUTHERN DISTRICT OF NEW YORK

EXHIBIT VOLUME

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India in 74-1629 and Defendants-
Appellees Aetna Casualty &
Surety Company, American Mo-
torists Insurance Company, Atlan-
tic Mutual Insurance Company,
Federal Insurance Company, Sea
Insurance Company, Ltd., Great
American Insurance Company,
United States First Insurance
Company, in 74-1632

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Appellees in 74-1632



INDEX OF EXHIBITS

Plaintiff's Exhibits

Exhibit

- 1(B). Diagram (small size) of Doxford Engine.
- 5. Photograph.
- 6. HELLENIC SAILOR Blueprint—Main Engine Crankshaft.
- 7(O). Photograph.
- 7(P). Photograph.
- 7(Q). Photograph.
- 7(S). Photograph.
- 21. Lloyd's Register of Shipping Certification dated March 24, 1966.
- 23. Alignment readings—October 11, 1967.
- 25. Alignment reading.
- 26. Letter of Charles Allen to Chief Engineer Evangelou dated 6 November, 1967.
- 31. Statement of General and Particular Average.
- 32. Doxford Information Sheet No. 1.
- 33. Doxford Information Sheet No. 2.
- 35. Chief Engineer's composite wire alignment diagram (original of Defendants' Exhibit A).
- 36. Alignment readings—February 3, 1968.
- 39. Alignment readings—February 3, 1968.
- 40. Photograph.
- 41. Photograph.
- 42. Photograph.
- 43. Photograph.
- 45. Photograph.
- 46. Photograph.
- 47. Photograph.
- 48. Photograph.
- 49. Photograph.
- 52. Photograph.
- 52(A). Photograph.
- 52(B). Photograph.
- 62. Golten Marine Co., Inc. invoice dated December 12, 1962.
- 65. Lloyd's Report of Survey dated June 2, 1968.

Defendant's Exhibits

Exhibit

- A.** Chief Engineer's composite wire alignment diagram (copy of Plaintiff's Exhibit 35).
- B.** Photograph.
- E.** Golten Marine invoice dated October 5, 1962, alignment and deflection readings.
- K.** Sun Shipbuilding & Drydock Company letter to American Bureau of Shipping dated September 14, 1960.
- L.** Alignment readings—November 20, 1963—and Charles Allen's letter to Chief Engineer Papayiannis dated November 29, 1963.
- M.** Alignment readings—September 8, 1964—and Charles Allen's letter to Chief Engineer Papayiannis dated October 8, 1964.
- N.** Alignment readings—February 1, 1966—and Charles Allen's letter to Chief Engineer Papayiannis dated April 22, 1966.
- P.** Alignment readings—August 2, 1966.
- Q.** Final reading after completion of repairs at Bombay—August 16, 1968.
- V.** Alignment and deflection readings.
- AL.** Recapitulation of main engine crankshaft alignment readings.

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THE PRINTED EDITION OF THIS VOLUME
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OF TEXT IN THIS MICROFICHE EDITION

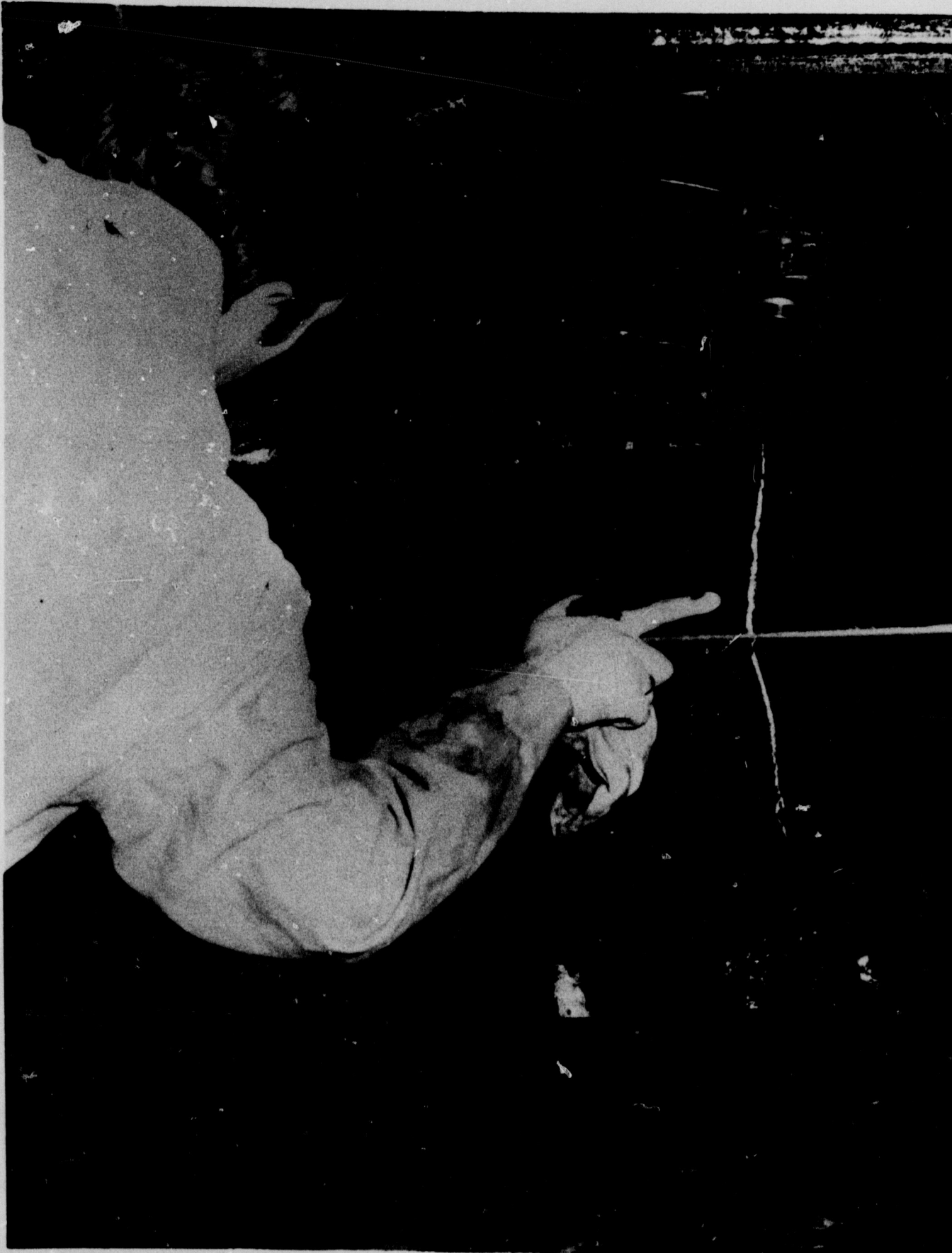
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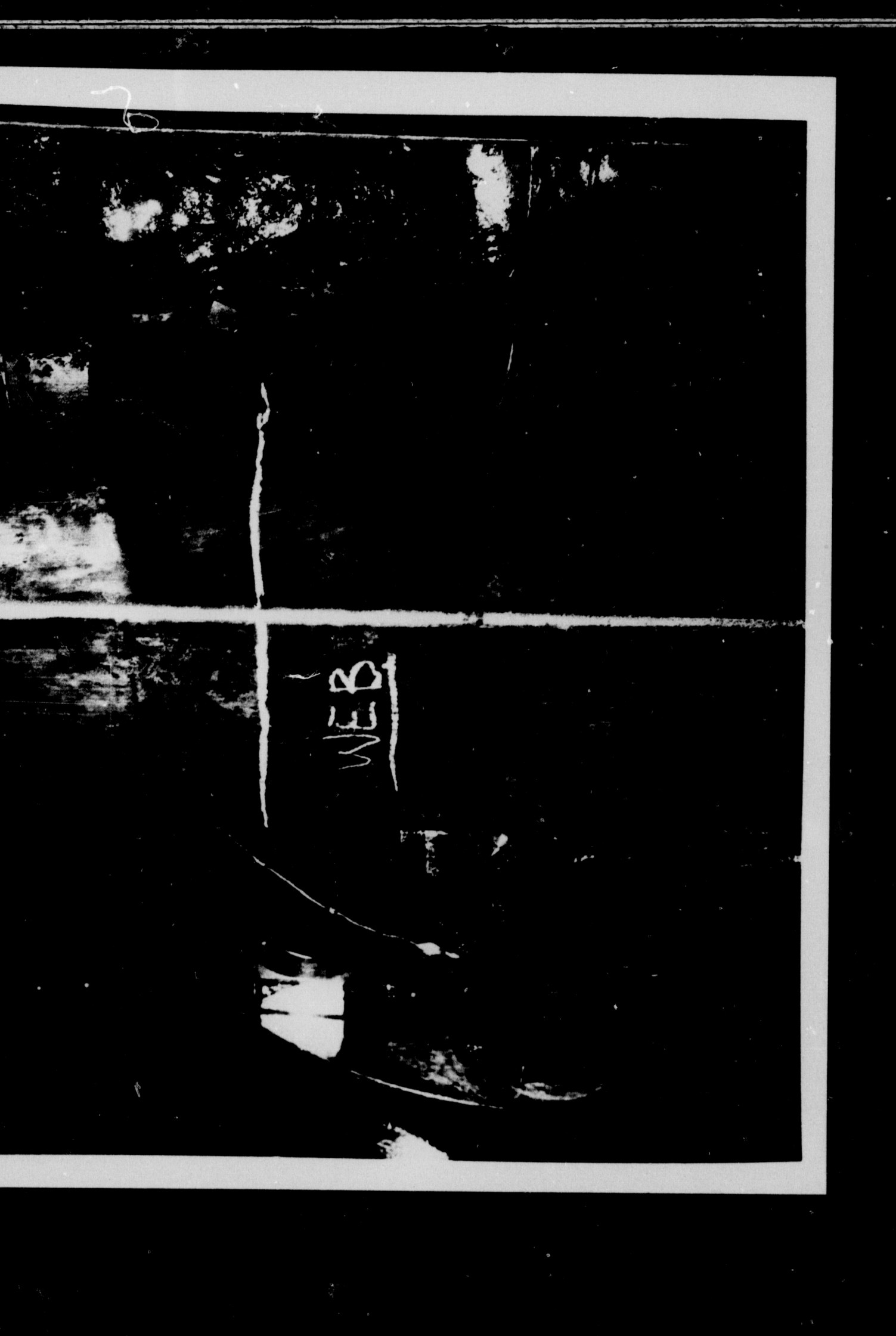


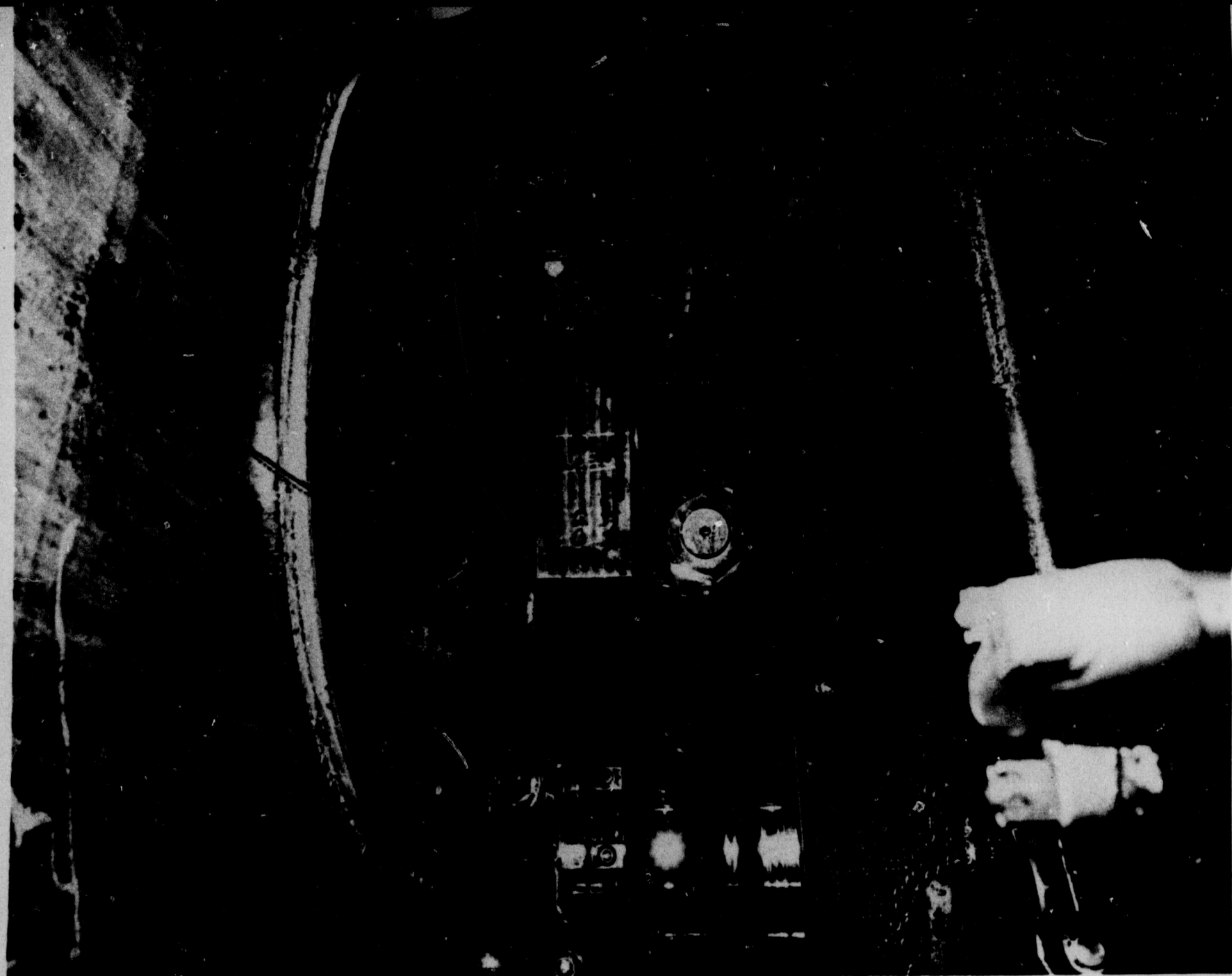
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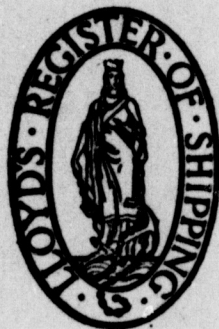








COPY
LLOYD'S REGISTER OF SHIPPING



Port.....

Date.....

This is to Certify *that I have surveyed part of the machinery*
of the **M.S. "HELLAND SAILOR" 6251** *gross tons* **of** *steam*
for **C.S.M. whilst afloat at this port on the 5th March 1966 and subsequently**

and that all my recommendations have been carried out to my satisfaction. I
am reporting accordingly and recommending to the Committee of Lloyd's Register
of Shipping that the machinery classification should be retained and the following
survey records assigned **C.S.M. (with date) when the survey has been completed**
subject to an outstanding condition of class being dealt with as previously
recommended.

main engine no. 2,3,4, and 5 journals and warps.

oil fuel transfer pump (outboard),

steering machinery,

windless

Pls Kt P for
at Wb 8/27/73

A. H. K. D. P. Teleatic
Surveyor to Lloyd's Register of Shipping

KEY TO ABBREVIATIONS

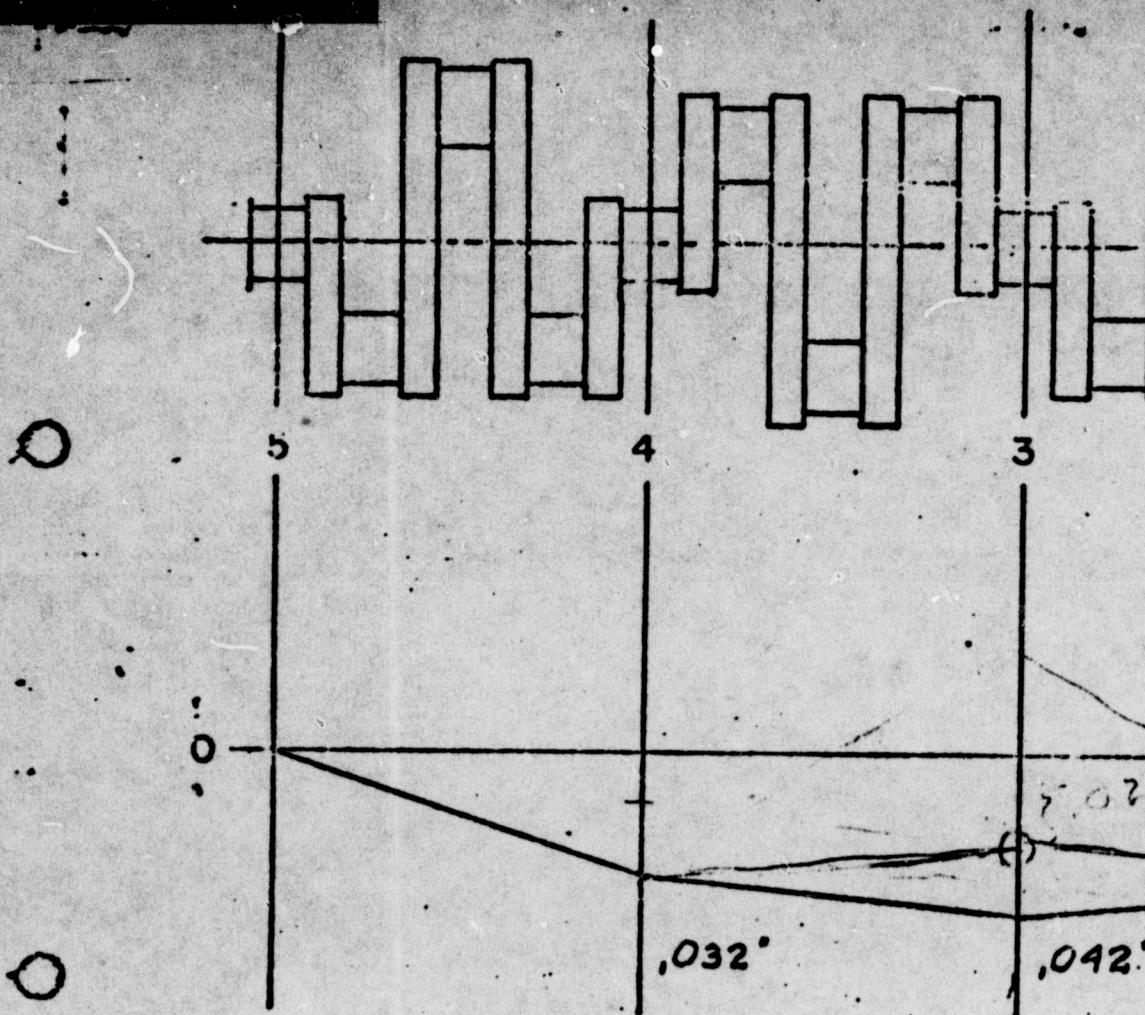
ABS	Auxiliary Boiler Survey	MBS	Main Boiler Survey	TS	Talkhaft Survey
CSM	Continuous Survey of Machinery	OF	Fixed for oil fuel (date) 150° F.	TRCL	Talkhaft Survey—Continuous Line
DBS	Douglas Boiler Survey	SJS	Steam (Jacket) Survey	TSH	Talkhaft Survey
ES	Engine Special Survey	SFS	Steam (Jacket) Survey	TRQG	Talkhaft Survey—On Qland

This Certificate is issued upon the terms of the Rules and Regulations of the Society, which provide that:—

"The Committee of the Society use their best endeavours to ensure that the functions of the Society are properly executed, but it is to be understood that neither the Society nor any Member of any of its Committees nor any of its Officers, Servants or Surveyors is under any circumstances whatever to be held responsible or liable for any inaccuracy in any report or certificate issued by the Society or its Surveyors, or in any entry in the Register Book or other publication of the Society, or for any act or omission, default or negligence of any of its Committees or any Member thereof, or the Surveyors, or other Officers, Servants or Agents of the Society."

N. Cert. B.I. 240m.9.65 (MADE AND PRINTED IN ENGLAND.)

ONLY COPY AVAILABLE



W/V "HELLENIC SAILOR"

DATE: 10-11-67

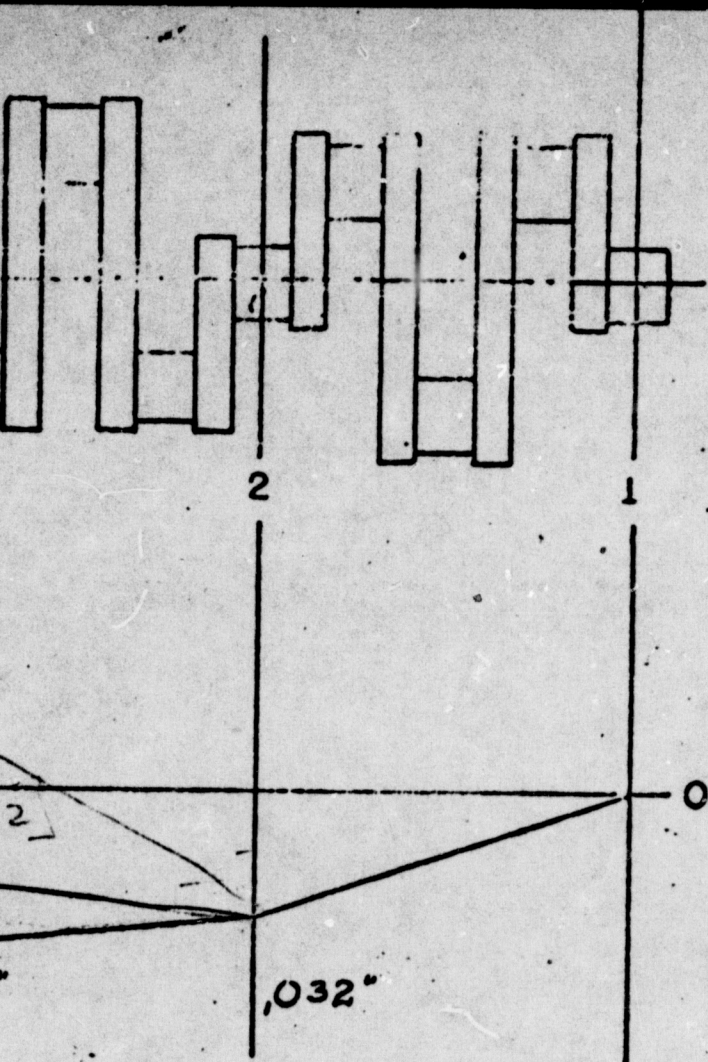
DRAFT:

WIRE: .016"

FWD.: 12'-6"

WEIGHT: 30 lbs.

AFT: 22'-10"



WIRE-GAGE-READINGS ALONG
CRANKSHAFT ON DOXFORD ENGINE

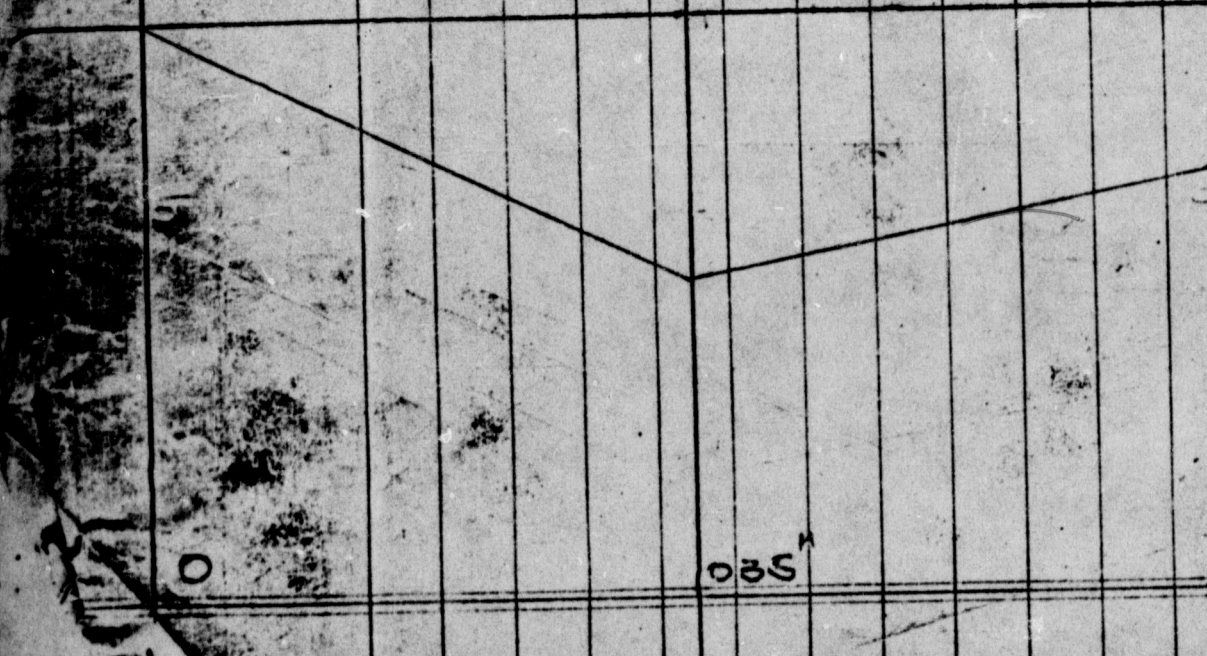
GOLTEN MARINE CO., INC.

$$\begin{array}{r} 410 \\ 375 \\ \hline = 35 \end{array}$$

$$\begin{array}{r} 39 \\ 37 \\ \hline = 2 \end{array}$$

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5 12 4



As mentioned previously in the

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= 23

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3

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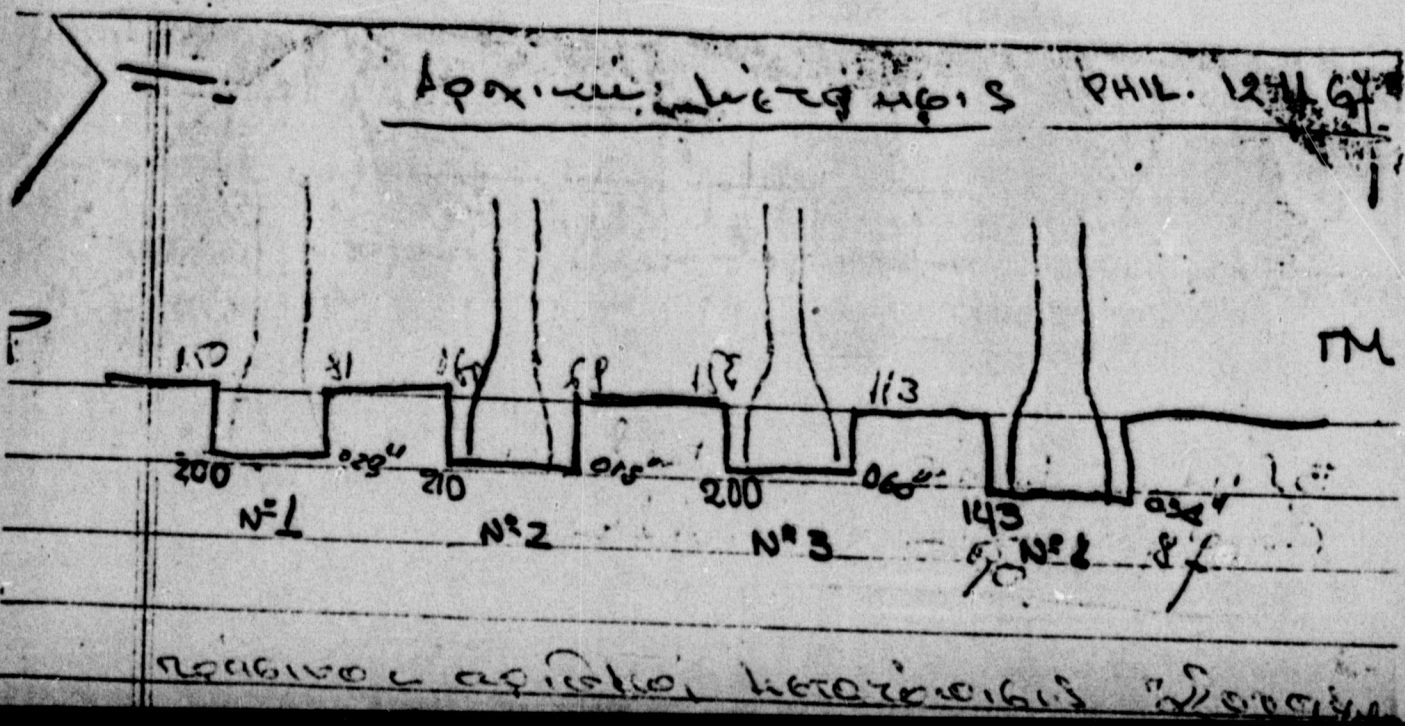
Depth 44-A
found
12/8/23/13

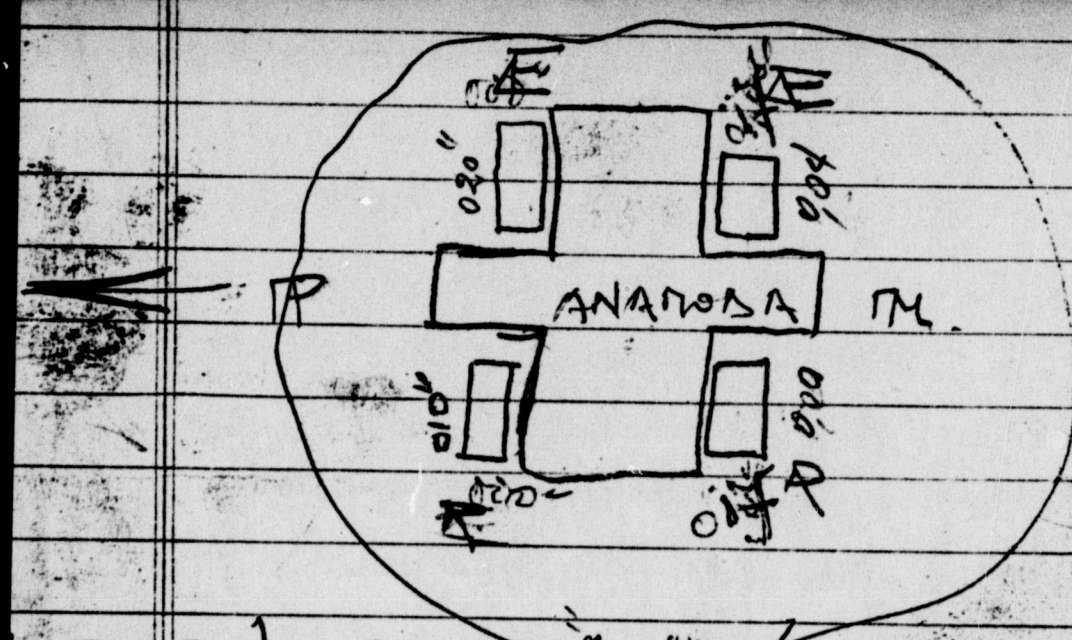
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023"

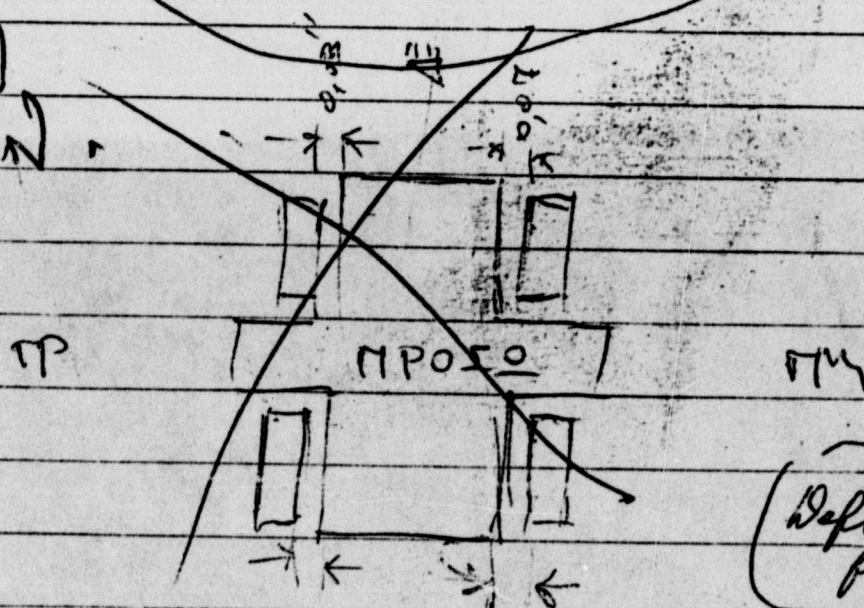
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ASTERN
POSITION



Deflt X 44-B
for
2.58/23/73

Mr. Jim Gibson Dephosphorization
Corrosion Control and Dephosphor-
ization Unit 10°F. —
(K. Gibson Dephosphorization Unit)

6 November 1967

CA:SE:CS
FILE #49

Mr. M. Evangelou, Chief Engineer
M.S. HELLENIC SAILOR
c/o Furners, Withy & Company, Ltd
312 Lafayette Building
Philadelphia, Pa. 19106

RE: M.S. HELLENIC SAILOR
MAIN ENGINE CRANKSHAFT ALIGNMENT

Dear Mr. Evangelou:

Enclosed herewith please find your file copy of pilgrim wire readings as taken while your ship was at our port. Please note the position of the crankshaft, with Nos. 2, 3 and 4 below the "0" line. It is important to observe the ship's draft while the readings were taken and with 12'6" forward the ship would be in a comparatively light condition causing the deflection to be below the "0" line, although the figures show an excess over the desirable measurements.

We will take further readings at the next available opportunity with the ship in both loaded and light conditions.

Thanking you, we are

Very truly yours,

HELLENIC LINES LIMITED

CHARLES ALLAN

Encl.
cc: Piraeus

REPORTS OF SURVEY AT BOMBAY (Cont'd)

DAMAGE REPAIRS (Cont'd)

NOTE: Nos. 1 and 5 journals were used as the datum line points for the Pilgrim wire.

All other bearings were removed and the crankshaft suitably supported with dummy bearings.

No.3 bearing was machined and Nos. 2 and 4 bearings remetalled, bored, scraped and fitted.

The checking of the shaft with the Pilgrim wire was done after each operation on the main bearings which necessitated the removal of bearings from time to time for adjustments and eventually the alignment with all connecting rods and pistons in position was considered satisfactory by all concerned.

The Repairers supplied and fitted split brass bushes for steadying of the boring bar which was used for the coupling bolts.

The boring bar was found to be too long and had to be cut and re-machined, which was done by the Ship Repairers.

On the instructions of the Owners' Representative the Repairers supplied 4 copies of the vessel's log book.

All dirt and rubbish consequent upon the repairs in both the engine room and No.3 hold was collected and removed ashore.

The two lubricating oil pumps were refitted in position, connected up and tested.

One end cover which had been broken by the ship's staff in the removal of the pump was renewed together with the commutator brushes and brush holders.

The commutator was skimmed and the micas undercut.

Both of the electrical driven lubricating oil pumps were reset in position with new joints and bolts and finally tested and proved satisfactory.

The fractured crank was split apart in way of the breakage and a sample of material cut out which was sent to Lloyd's Register Research Department, Crawley, England, for an analysis.

The main engine exhaust belt glands and expansion joints were opened up, overhauled, repacked and refitted.

The gratings in way were removed for access and afterwards refitted.

NOTE: By agreement 25% of this item was allowed against the damage repairs.

No.3 piston lower water cooling swinging link pipes were removed, sent to the workshop, overhauled, tested to 600 lbs. per sq. inch, replaced on board and refitted.

The main engine thrust was opened up, the lower half carrier bearings removed for checking purposes also the thrust pads after which the unit was boxed up and adjusted.

No.2 unit crosshead bearings were dismantled, removed ashore, refitted and adjusted.

October, 1960.

ALIGNMENT OF ENGINES AND SHAFTING.1. INTRODUCTION:

Experience over a number of years has shown that unsuitable alignment of the main engine crankshaft/intermediate shafting assembly can have adverse effects on the running of the main engine and can, in extreme cases, result in damage to the crankshaft. This phenomenon is by no means restricted to Doxford engines or, indeed, to diesel engines in general since similar difficulties have been experienced with the main reduction gearing of steam-turbine drive vessels, particularly in aft-end installations.

As far as Doxford are concerned, serious troubles from this cause have been almost entirely restricted to a small proportion of vessels and have mainly occurred in aft-end installations. Some of the technical aspects which led up to the consideration of this problem have already been described in the paper "Some Crankshaft Failures: Investigations, Causes and Remedies" by R. Atkinson and F. Jackson (Transactions Institute of Marine Engineers July 1960) but it is hoped that further information of the broader aspects of engine alignment applicable to all types of vessel will be found useful in promoting trouble-free operation.

Before considering the matter in detail, two fundamental points must be borne in mind:-

- (1) It is not sufficient to consider the alignment of the crankshaft alone - any abrupt change in alignment between the crankshaft and the intermediate shafting can affect the crankshaft.
- (2) In most vessels, appreciable changes in alignment occur between light and loaded ship conditions.

Considering point (1) more closely, Fig. 1(a) shows the alignment of the crankshaft only of an actual vessel; this appears to be satisfactory. The full line in Fig. 1(b), however, shows the...

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Found
20/11/72

...combined alignment of the crankshaft and intermediate shafting and this is obviously unsatisfactory. In this particular case, trouble had been experienced with excessive main bearing wear and remedial action consisted of re-chocking the engine so as to lower the forward end. The final result achieved was as shown by the broken line in Fig. 1(b) in which condition the main bearing difficulties ceased. The particular example quoted obviously represents an extreme case, the defective alignment condition having almost certainly been brought about by grounding of the vessel (damage to the ship's structure was not readily apparent and the effect on the engine was hitherto unsuspected) but it is used as an illustration of the principle concerned.

Turning now to point (2), it has been generally believed in the past that, in aft end installations, ship movements between light and loaded conditions were insignificant. Figs. 2(a) and 2(b) show the change in alignment in an actual oil tanker between the fully loaded and the ballast condition. When considering these diagrams, it should be noted, firstly, that the fore and aft distances are relatively short with the result that the changes in angle are comparatively high and, secondly, that the alignment of the engine itself does not change to any great extent. The point to be made here is that large angular changes involve large bending moments, particularly where large diameter intermediate shafting is fitted from torsional vibration .. other considerations.

Still referring to point (2) but dealing now with amidships installations, Figs. 3(a) and 3(b) show similar alignments for a dry cargo vessel in the loaded and ballast conditions - these curves cover the engine itself plus the forward length of intermediate shafting extending as far as the after bulkhead of the engine room. It should be noted that, in this particular example also, only a small movement occurs in way of the engine itself (i.e. over the section from No.1 to No.5 main bearing) but this should not be regarded as a vital necessity for all installations. Appreciable movements in way of the engine can and do occur in some cases, for...

...example in a ship having fine lines particularly if a high powered (and therefore long) engine were fitted and the engine is perfectly capable of accepting these movements provided that the "basic" alignment is such as will avoid extreme conditions arising in service. For example, if the alignment of the crankshaft is hogged when the vessel itself is sagged, a large hog will arise when the ship hogs due to loading and this is most undesirable. The optimum condition is that the shaft is in a sagged condition when the ship itself is sagged and approaches a straight line when the ship is at maximum hog. This matter is considered further under Section 2 below.

Reverting to Figs. 3(a) and 3(b) it will be noted that a large change in alignment occurs where the intermediate shafting joins the crankshaft. This means that although the engine seating itself is of adequate strength, it would have been beneficial if this strength had been continued further aft under the shafting to ease the severity of the 'break' in the alignment. Although the angular change here is greater than that in the tanker mentioned under Fig. 2 above, the effect on the engine was reduced due to the smaller diameter shafting.

The question of discontinuity in strength at the after end of the main engine seating has already been investigated by a number of authorities and is now, in fact, covered in Lloyd's Rules with application to all engines but it should always be borne in mind when considering the design of the ships structure in way of the main engine and shafting.

To avoid misconception it must be stated that the changes in alignment referred to above occur in any ship (the average 500 ft. ship deflects about 6 inches over its full length between light and loaded conditions) and, moreover, no difficulties will be experienced provided that the alignment of the engine and shafting is arranged to accept these movements. For example, in vessel C, the alignment was altered somewhat to remove the "mountain peak" in way of No. 5 main bearing. No structural alterations were made so that the extent of the angular change remained unaltered but, when the shafting had been ...

...corrected, the bearing wear down which had previously been experienced immediately ceased. Similarly, large changes in alignment must occur in rough weather but these are of such short duration that no ill effects are experienced; it is continuous running with incorrect alignment that may prove damaging.

II CORRECT CONDITIONS:

When considering the establishment and maintenance of correct alignment conditions either in new ships or vessels already in service, it must continually be borne in mind that the statements made in this report (unless specifically stated to the contrary) refer to overall alignment of the shafting system including at least the first length of intermediate shafting.

Optimum conditions, then, are as follows :-

- (1) Abrupt discontinuities in alignment between the engine and the first length of shafting should be avoided. This applies particularly to aft end installations where large diameter intermediate shafting is used.
- (2) The alignment should be such as will minimise the possibility of the shafting becoming "hogged" under any normal condition of ship loading; the desirable condition is that the shafting assembly lies as nearly as possible in a straight line when the ship as a whole is in the condition of maximum 'hog' (probably the fully loaded condition). The appreciable sag in the shafting which will then arise when the ship itself is "sagged" (e.g. in the 'blast condition') is acceptable. The reason for the avoidance of the "hogged" condition of the shafting is that experience has shown an apparent tendency towards "whirling" or other irregular movement of the crankshaft under this condition, with resultant harmful effects on the main bearings and unduly high stress in the crankshaft itself. This tendency is particularly pronounced if a "peak" in the alignment...

...occurs at the after end of the engine. For example, in vessel C, wear down of No.4 (and to some extent No.3) main bearing was experienced with the original alignment.

- (3) The alignment of the crankshaft itself should be a smooth curve. Here again it is desirable to avoid any appreciable "hog" but the main requirement is the avoidance of abrupt changes between main bearings. This matter is referred to more fully under "Bearing wear down" below.

III CHECKING PROCEDURE:

MI The equipment used by Doxford for checking alignment of ships in service is of the "Pilgrim" taut wire type but it is not proposed to include detailed instructions regarding its use in this report. Doxford have Service Engineers and equipment for checking alignments as required or will be pleased to supply further details on request. Whenever an alignment check is made, the following matters should be considered:-

- (a) The ship loading condition at the time should be recorded. A specimen sheet as used by Doxford for this purpose is shown in Fig.4.
- (b) All existing methods of checking alignment with the shifting in place depend on measurements from the tops of the crankshaft journals etc. It is therefore vitally important that the actual diameters of these journals should be known as accurately as possible. Cases have occurred where alignment readings have been reported without reference to the fact that some of the journals had been machined to appreciably less than their original diameter.
- (c) It is desirable that the alignment check should be taken with the vessel in the condition of maximum "hog" (see Condition 2 above). It is appreciated that this may present difficulties, particularly with dry cargo vessels, since opportunities to check alignment in the loaded condition may be rare but, ...

...provided the actual loading condition of the ship is reported, Doxford will be pleased to advise. If at all possible, it is most advantageous for a full set of checks to be made for different conditions ranging from the fully loaded to the light condition. This not only establishes the extreme conditions of alignment but also allows future checks to be made in any loading condition; reference back to the original figures for the corresponding condition will show up any change that may have occurred.

IV MAIN BEARING WEARDOWN:

Main bearing wear-downs do not in themselves give any true indication of overall alignment but, assuming the alignment to be generally in accordance with the conditions laid down above, they can be of considerable value if interpreted in the following manner :-

- (i) Heavy wear-down on one bearing compared with those on either side obviously causes a "hollow" in the crankshaft alignment. The extent of such "hollows" can be controlled by ensuring that the limits laid down in the description under Fig. 5 are not exceeded.
- (ii) Heavy wear-down of the bearings in the central portion of the engine compared with the end bearings indicates a heavily sagged crankshaft even if the limits laid down under Fig. 5 are not exceeded. It is recommended that the maximum wear-down of any bearing should not greatly exceed 1 m.m. (.040 inches) before re-metalling.
- (iii) When re-metalling bearings, particularly if isolated bearings only are concerned, a similar check to that described under Fig. 5 should be applied. In this case the bearing should be machined in such a way as to avoid any tendency towards excessive local "hogging" of the shaft. (See Fig. 6)

CRANKSHAFT DEFLECTIONS:

Due to the fundamental design of the Duxford engine, crankshaft deflections do not form as sure a guide to alignment as may be the case in some other designs. It is hoped, however, that the following points will be found useful:-

- (1) The Duxford crankshaft when truly aligned (i.e. with the centre lines of all journals lying in the same straight line) has relatively large 'natural' deflections. The records taken when the engine was first erected in the Enginebuilders shops should therefore be regarded as a basis when considering actual figures obtained from a ship in service.
- (2) Changes in ship loading affect crankshaft deflections to some extent but mainly at the after end of the engine. In Fig.7 actual vertical deflections of all four cranks of a four cylinder engine are plotted against mean draught which forms a measure of the ship loading. These figures are taken from a typical dry cargo ship with engine amidships and it will be noted that the variation at No.4 centre crank is very much greater than at Nos. 1, 2 and 3. The ship loading condition should therefore be noted when considering the deflections of the aftermost cranks since, while a vertical deflection as low as .005 inches at this position may be perfectly acceptable when the ship is fully loaded (i.e. at maximum hog), the same reading is unsatisfactory when the ship is light due to the change which will occur during loading.
- (3) In general, bearing in mind the variations mentioned above, deflection readings should not go beyond the limits of .005 inches and .035 inches (see note below) but if these limits are approached, a careful check should be made on main bearing wear-downs as described under Section IV paragraph 1 above. If this check discloses....

...no discrepancies, a check on the overall alignment should be undertaken.

NOTE: In this report it is assumed that the vertical deflection readings are recorded in such a way that a positive reading indicates a tendency towards a sagged condition - the larger the deflection the greater the sag. Noting the natural tendency of the shaft to sag between bearings due to its weight, a negative reading indicates a heavily hogged condition which must be avoided.

Note also that when taking deflections, particularly in the after section of the engine, the turning gear should be eased back before the readings are taken to avoid any tendency of the worm drive to displace the shaft in the vicinity of the turning gear.

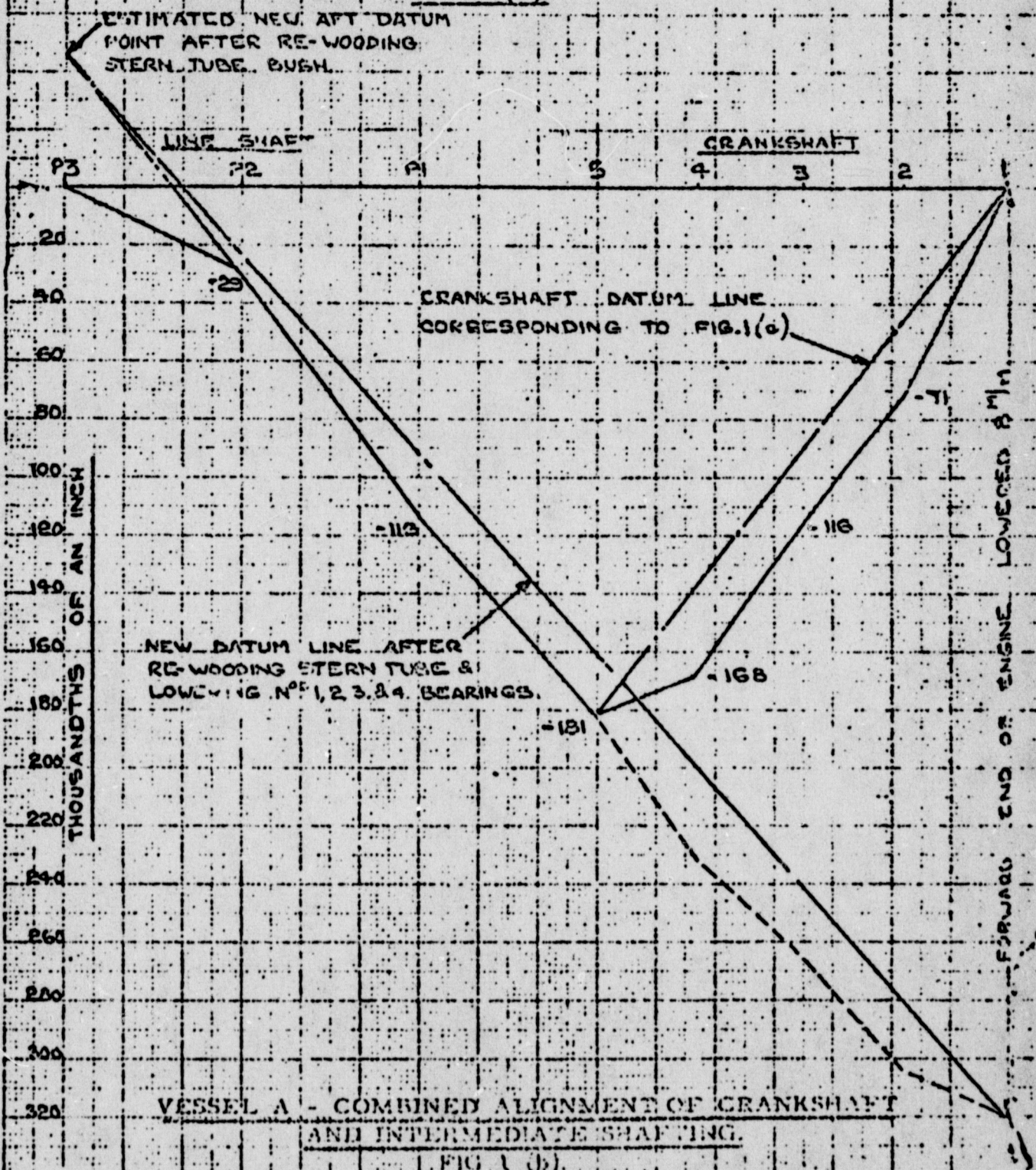
William Duxford & Sons (Engineers) Ltd..
Pallion, SUNDERLAND,
England.

MAIN BEARINGS



VESSEL A - ALIGNMENT OF CRANKSHAFT ONLY.

FIG. 1(a)



VESSEL A - COMBINED ALIGNMENT OF CRANKSHAFT AND INTERMEDIATE SHAFTING.

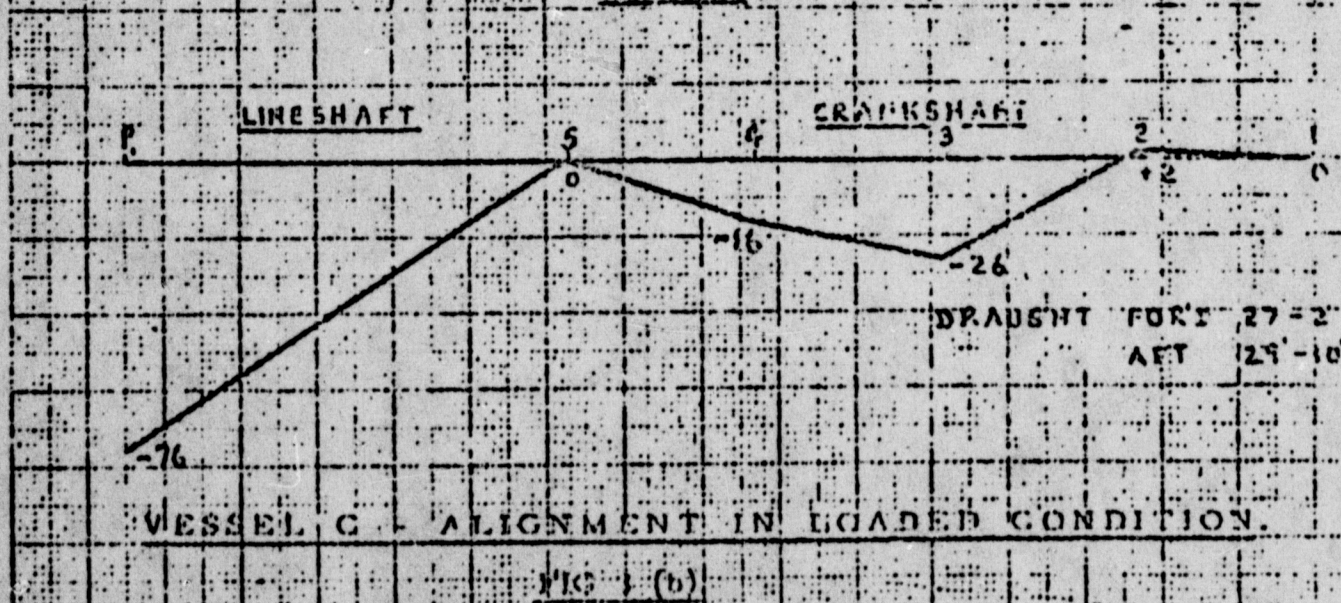
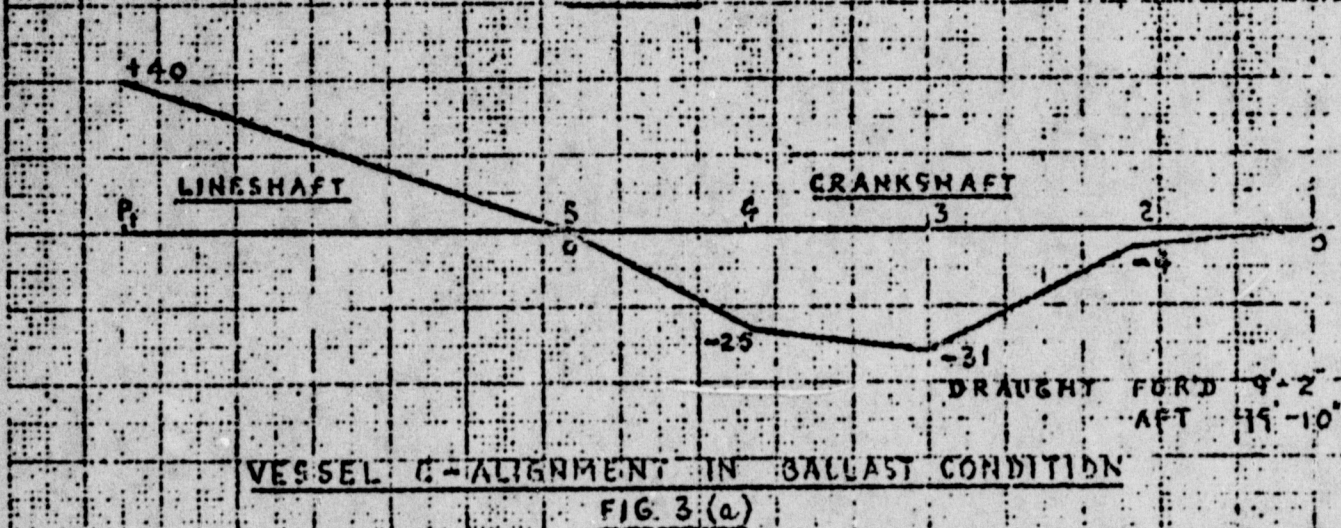
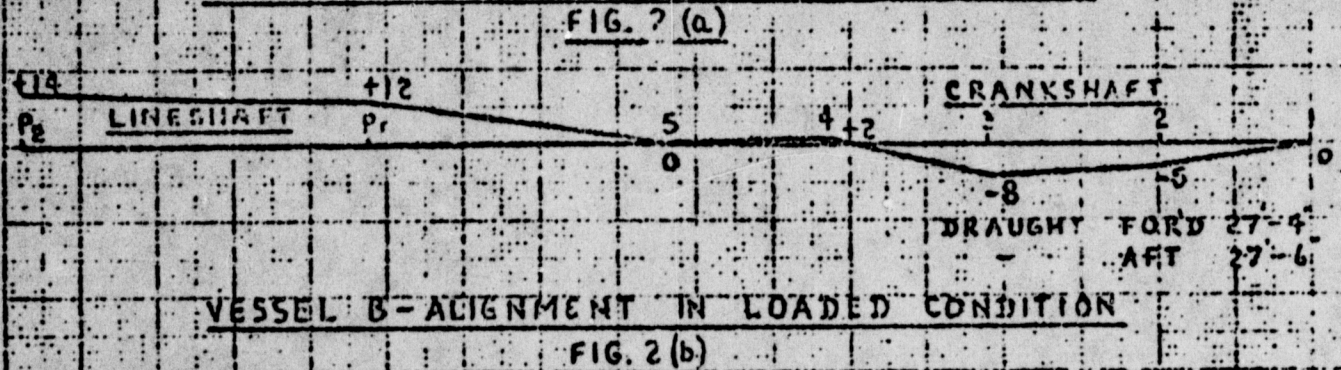
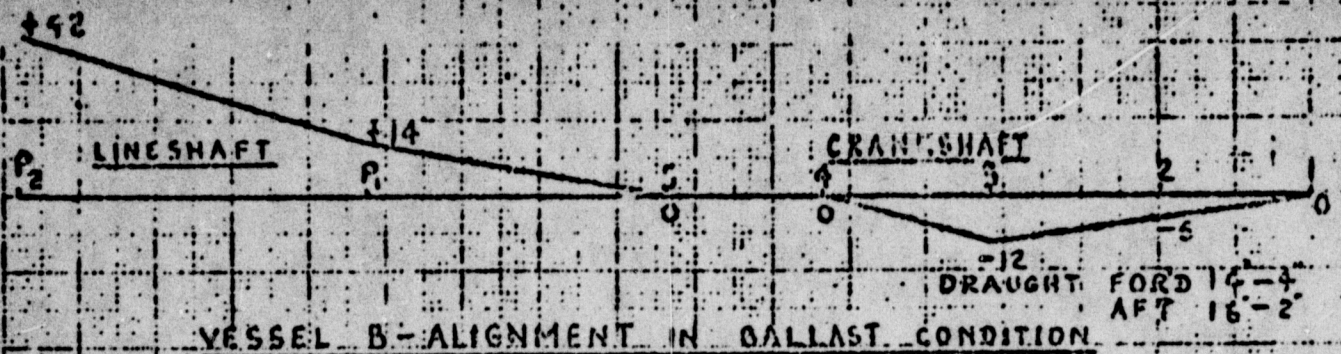
FIG. 1 (b).

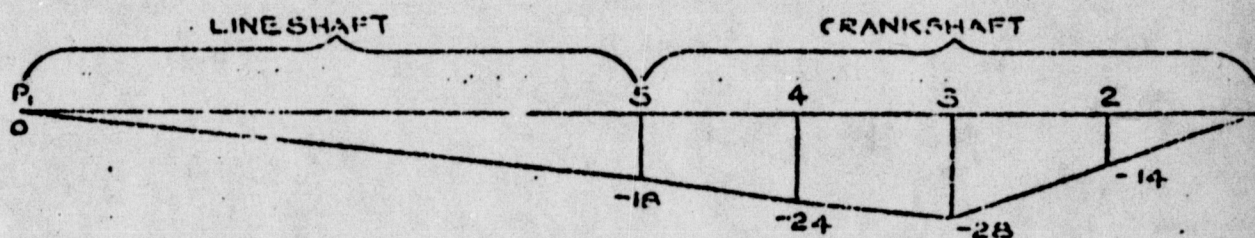
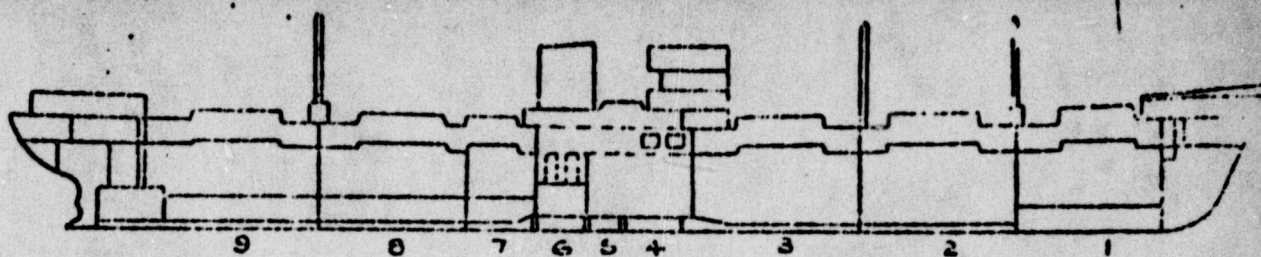
DATE - OCTOBER 1960

TITLE INFORMATION SHEET NO. 1.

FIG. 1.

W14 DOYFORD & SONS (ENGINEERS) LTD.





COMPARTMENT	TONS
HOLDS No 1	800
No 2	1000
No 3	300
No 4	1800
No 5	1300
FORE PEAK	0
DEEP TANK	0
AFTER PEAK	100
D.B. TANKS No 1	0
No 2	0
No 3	300
No 4	65
No 5	0
No 6	35
No 7	80
No 8	160
No 9	100
LIGHT SHIP	4500
TOTAL DISPLACEMENT 11,040	

DRAUGHT	FT	IN
FORWARD	20	0
AFT	21	6
MEAN	20	9

M. V _____
 AT _____
 DATE _____

SHAFTING ALIGNMENT

DATE:- OCTOBER 1960
WM. DOXFORD & SONS (ENGINEERS) LTD

TITLE:-
 INFORMATION SHEET No
 FIG. 4.



FIG. (i)

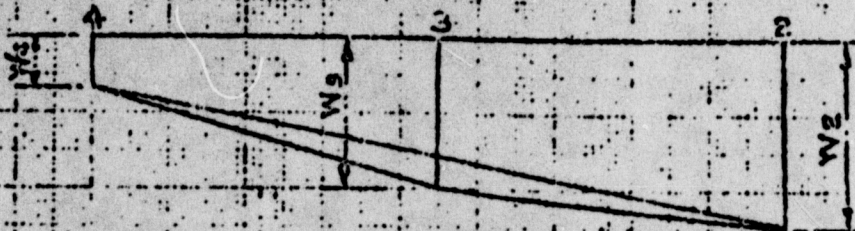


FIG. (ii)

- (a) Consider Bearing Nos. 1, 2 and 3.
- (b) Plot wear-down readings W_1 , W_2 and W_3 as shown in Fig (i).
- (c) Join the lower ends of the lines W_1 and W_3 by a straight line as shown, the projection of W_2 below this straight line should not exceed 0.015 inches.
- (d) Repeat for Bearings 2, 3 and 4 as shown in Fig (ii), in this case the projection of W_3 should not exceed 0.015 inches.
- (e) Repeat for Bearings 3, 4 and 5; 4, 5 and 6 as necessary.

LIMIT OF RELATIVE WEAR OF MAIN BEARINGS

FIG. 5

DATE: OCTOBER 1960.

TITLE: INFORMATION SHEET NO. 1.

W13 DOXFORD & SONS (ENGINEERS) LTD

ONLY COPY AVAILABLE
FIG. 5.

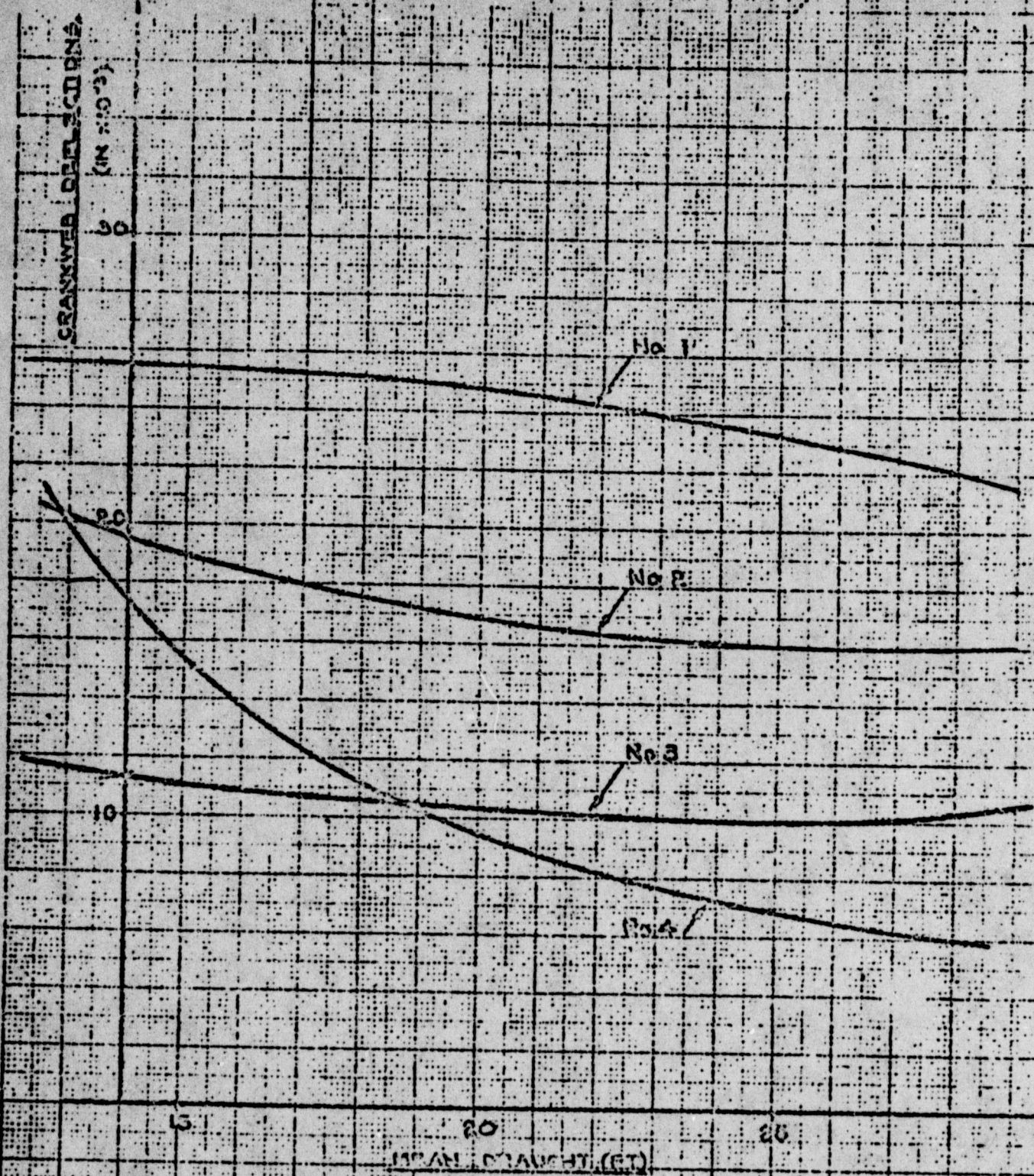


- (a) Assume No. 2 Bearing requires re-metalling.
- (b) Plot known wear-downs (W_1 and V_3) of Nos. 1 and 3 Bearings.
- (c) Join lower ends of lines W_1 and W_3 .
- (d) Bearing No. 2 should be re-metalled so that after final fitting, the Bridge Gauge Reading shows an "apparent" wear-down W_2 such that its lower end (Point X) lies on or slightly below the line joining V_1 and W_3 .

NOTE:- Due to the difficulty of measuring an accurate crown thickness in spherical-shelled Bearings, it may be found advantageous to bore the Bearing concentric (or even slightly 'high') in the first place, try it in position, take a Bridge Gauge Reading and subsequently correct as necessary to give the desired result.

PROCEDURE WHEN RE-METALLING BEARINGS.

FIG. 6



CRANK WEB DEFLECTIONS VERSUS MEAN DRAUGHT.

FIG. 7.

May 1964.

INSTRUCTIONS FOR PERMISSIBLE CRANKSHAFT WEB DEFLECTIONS.

INTRODUCTION

In our Information Sheet No. 1 it was pointed out that crankshaft deflections at that time did not form as sure a guide to alignment for D-oxford engines as for some other designs. This question has since been the subject of considerable research and we can now calculate the stresses in the crankshaft corresponding to a set of deflection readings. Adherence to the new instructions for permissible web deflections, which are presented in this information sheet, will ensure that shaft stresses due to misalignment do not exceed a safe limit.

The instructions given on the following pages have been issued to replace the following section in our instruction book for engines prior to the P-type.
"Guidance Notes on Crankshaft Alignment - Centre Crankweb Deflections, including sketches Nos. 51, 52 and 53.

GUIDANCE NOTES ON CRANKSHAFT ALIGNMENT.**Centre Crankweb Deflections.**

Every 3,000 hours running, the web deflections should be checked. This check must also be carried out after any repair of the main bearings, the bedplate or rehooking of the engine.

If the misalignment figures calculated from the web deflections do not comply with the limits given in Sketch No: 53a, b or c according to engine size, the crankshaft must be realigned.

To measure the deflections, refer to Sketch No.51 and take the following precautions :-

- (a) THE TURNING GEAR MUST REMAIN IN ENGAGEMENT WITH THE TURNING WHEEL to ensure that the crankshaft will not turn inadvertently and cause danger to personnel.
- (b) Turn the crankshaft in one direction only to ensure that repeatable readings are obtained.
- (c) When the crankshaft is in the checking position, the turning motor should be given a 'kick' in the opposite direction to ensure that the load is taken off the turning wheel. The turning gear can affect deflection readings of the adjoining engine crank.
- (d) Ensure that the camshaft driving chain has not been over-tightened as the readings may be affected thereby.
- (e) Use the dial gauge supplied with the engine. The gauging points are on the centre lines of the webs at approximately $\frac{3}{4}$ " from the tips. A small "O" is stamped on the webs at the correct gauging points.
- (f) Rotate the crankshaft to bring the webs to be checked into the 'gauge at top' position. This is the position nearest to O.D.C. at which the gauge will clear the body of the centre connecting rod when positioned between the correct gauging points. It is convenient to set the dial gauge to zero for this position and this figure is entered in Sketch No.52 in the second line under the heading 'VERTICAL PLANE'.

ONLY COPY AVAILABLE

- (g) Rotate the crankshaft to bring the gauge to starboard, bottom and port successively as shown in Sketch No. 51. Enter all the readings in their correct position in Sketch No. 52. Careful attention should be taken to note whether a reading is positive (+) or negative (-).
- (h) Carry out (f) and (g) for all the cylinder sections.

NOTE: A positive (+) reading should be recorded as the gauging points become further apart, e.g. a reading of +10 is recorded in the 'gauge at starboard' position if the webs are 0.010" further apart than they were in the 'gauge at top' position.

In order to decide whether the deflection readings are satisfactory or not, the calculations shown by an example in Sketch No. 52 should be carried out. Blank sheets can be supplied on request by Dexford for these calculations.

VERTICAL PLANE

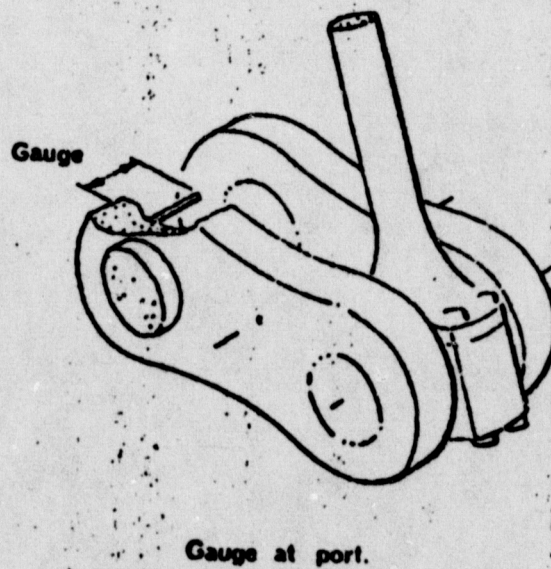
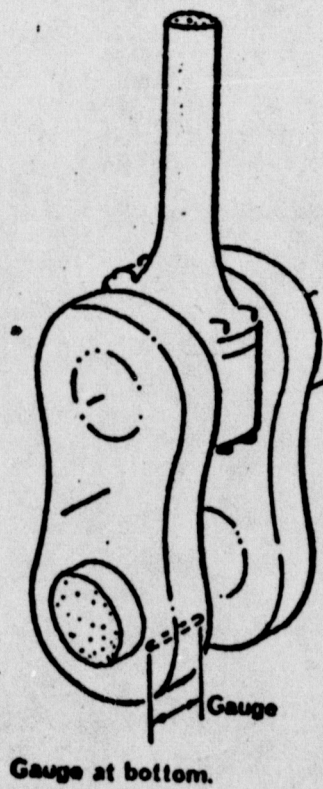
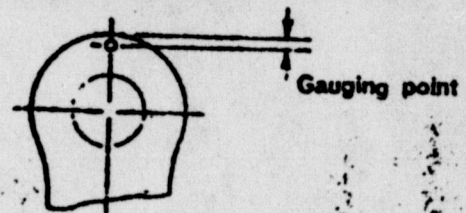
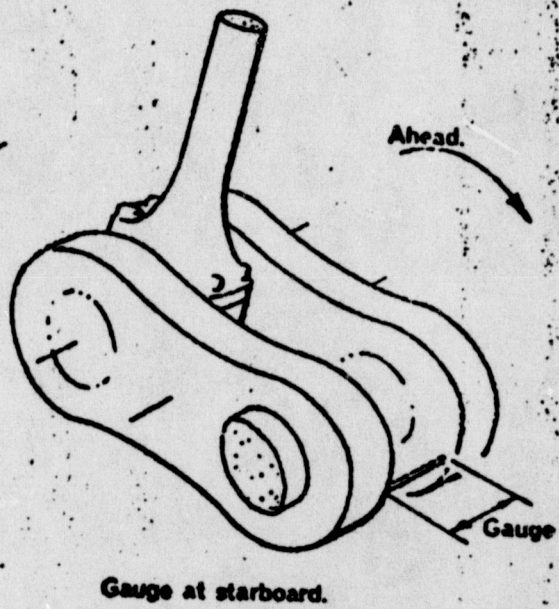
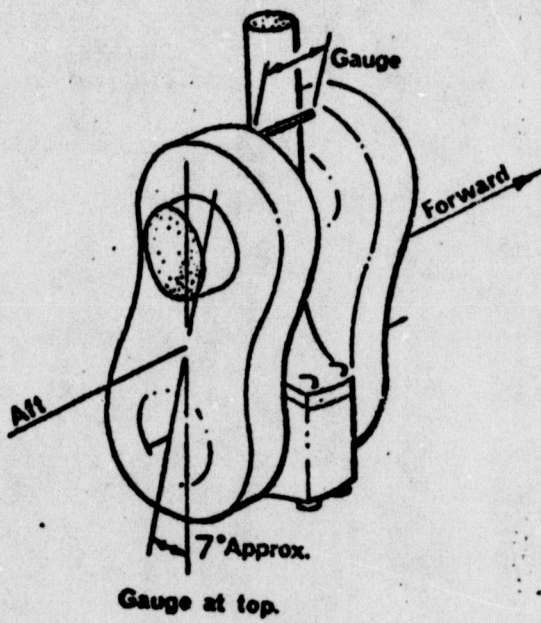
- (1) The reading taken with the gauge at top (a) is subtracted from the reading taken with the gauge at bottom (b) to find the measured deflections (fm).
- (2) The deflections for straight shaft (fs) are given in Sketch No: 53a, b or c, according to the size and type of engine. These deflections are those resulting from the deadweight of the shaft and running gear and are thus the "natural" deflections of the shaft in "straight" alignment. When filling in the figures on Sketch No. 52 ensure that the deflections for the right engine type are used in the right position in relation to the deflections for the cylinder cranks. For example, in a five cylinder engine with the scavenge pump between Nos. 3 and 4 cylinder the scavenge crank deflection is filled in under crank No. 4 and the deflection for Nos. 4 and 5 cylinders in Crank Nos. 5 and 6. The deflections for straight shaft are subtracted from the measured deflections to give the misalignment deflections (fv).

- (3) The quantities A, B, C, D, E and F are calculated from the misalignment deflections for the various cylinders by means of the formulae given on Sketch No.52 and these quantities should lie between the stated limits.
- (4) Any difference in temperature between the engine and the double bottom affects the web deflections in the vertical plane. The sea temperature and the lubricating oil temperature in the crankcase during the web deflection measurements should therefore be noted.
- (5) The loading conditions of the ship affect the web deflections in the vertical plane to a considerable extent. Readings should therefore be taken in both light and loaded conditions as opportunity permits, to check that the permissible limits are not exceeded at any time.

HORIZONTAL PLANE.

- (1) The reading taken with the gauge on port (c) is subtracted from the reading taken with the gauge on starboard (d) to find the measured deflection (f_h) which is equal to the misalignment deflection.
- (2) Neither deadweight, temperature, nor condition of loading should affect this deflection to any noticeable extent.
- (3) The quantities A, B, C, D, E and F are calculated from the misalignment deflections and should lie between the stated limits.

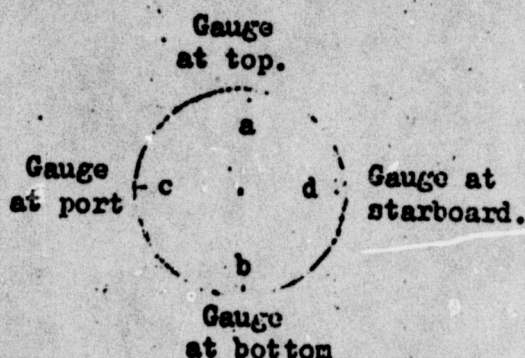
SKETCH NO. 51.



METHOD OF MEASURING CRANKWEB DEFLECTIONS.

CRANKWEB DEFLECTION READINGS

SKETCH NO. 22



Ship's Name.....
 Engine Type.....67LB5.CS.....
 Date of Gauging..16th February, 1961...
 Draft Forward....14'9".....
 Draft Aft.....16'0".....
 Sea Temperature..60°F.....
 Lubricating Oil Temp..67°F.....

NOTE: Crank No:1 at Forward End. All measurements in thousandths of an inch.
 For deflections for straight shaft and values of x,y,z & w see Sketch
 No:53a, b or c as applicable.

VERTICAL PLANE:

Crank Number	1	2	3	4	5	6	7
b = Reading, gauge at bottom	+20	+12	+17	-28	+12	+28	
a = Reading, gauge at top	0	0	0	0	0	0	
fm = b - a = measured deflection	+20	+12	+17	-28	+12	+28	
fs = deflection for straight shaft	+20	+9	+17	-5	+15	+14	
fv = fm - fs = misalignment deflection	0	+3	+0	-23	-3	+14	

A = fv crank 1 .. 0 .. B = fv crank 2-A .. +3 C = fv crank 3-B .. -3 ..
 D = fv crank 4-C .. -20 .. E = fv crank 5-D .. +17 F = fv crank 6-E .. -3 ..
 G = fv crank 7-F.....
 Realignment is necessary if any one of the measured deflections exceeds 40 or
 if any of A B C D E F or G fails to lie between x = +25 and y = -15.

HORIZONTAL PLANE

Crank Number	1	2	3	4	5	6	7
d = Reading, gauge at starboard	+8	+6	+7	-15	+5	+12	
c = Reading, gauge at port	+13	+7	+10	-11	+7	+15	
fh = d - c = misalignment deflection	-5	-1	-3	-4	-2	-3	

A = fh crank 1 .. -5 .. B = fh crank 2-A .. +4 .. C = fh crank 3-B .. -7 ..
 D = fh crank 4-C .. +3 .. E = fh crank 5-D .. -5 .. F = fh crank 6-E .. +2 ..
 G = fh crank 7-F.....
 Realignment is necessary if any one of A,B,C,D,E,F or G fails to lie between
 z = +15 & w = -15

WILLIAM DOXFORD & SONS (ENGINEERS) LIMITED.

SKETCH NO: 52

STRAIGHT SHAFT DEFLECTIONS "LB" ENGINES

LEVER SCAVENGE PUMP ENGINES.

1. DEFLECTION FOR STRAIGHT SHAFT

LIMITS ON A B C D E & P
on Sketch No. 52.

Cylinder Number	1	2	3	4	5	6	Vertical Plane		Horizontal Plane	
Crank Number	1	2	3	4	5	6	x	y	z	w
Engine Type:										
40SB3										
44SB3										
44SB4										
48SB3										
52LB3										
54L 4										
56L 3										
56LB3	+20	+10	+17				+25	-15	+15	-15
56LB4										
60SB3										
60LB3	+25	+12	+16				+25	-15	+15	-15
60SB4										
60LB4										
60LB4 SC	+24	+18	+20	+18			+20	-10	+15	-15
60SB5										
60SB6										
62L 4										
64L 4										
67LB3										
67LB4	+20	+16	+16	+15			+25	-15	+15	-15
67LB5	+22	+9	+19	+16	+16		+25	-15	+15	-15
67LB6	+20	+9	+17	+17	+10	+18	+25	-15	+15	-15
70LB4	+23	+17	+19	+17			+20	-10	+15	-15
70LB5	+19	+3	+16	+14	+14		+25	-15	+15	-15
70LB6	+19	+8	+16	+16	+9	+16	+20	-10	+15	-15
725SB6	+25	+11	+21	+20	+12	+21	+25	-15	+15	-15
75LB4	+23	+17	+18	+19			+20	-10	+15	-15
75LB6	+25	+10	+20	+20	+12	+20	+20	-10	+15	-15

STRAIGHT SHAFT DEFLECTIONS "LB" ENGINES

CENTRE SCAVENGE PUMP ENGINES

(4-cylinder)

fs. Deflection for straight shaft.						1) Kc Ks	Limits on A. P. C. D. & E. on Sketch No: 52.			
Cylinder No:	1	2	SP	3	4		Vertical Plane		Horizontal Plane	
Crank No:	1	2	3	4	5		x	y	z	w
ENGINE TYPE:										
48SB4										
56SB4										
56LB4										
60LB4	+22	+17	-8	+18	+14	2.1	+25	-15	+15	-15
64LB4	+22	+23	-13	+24	+19	1.7	+25	-15	+15	-15
67LB4	+22	+17	-8	+19	+17	1.1	+25	-15	+15	-15
70SB4	+25	+16	-9	+18	+17	1.1	+20	-10	+15	-15
725SB4	+24	+19	-10	+20	+19	1	+25	-15	+15	-15

CENTRE SCAVENGE PUMP ENGINES

(5 & 6 Cylinder)

fs. Deflection for straight shaft.								1) Kc Ks	Limits on A. B. C. D. E. F. & G. on Sketch No: 52			
Cylinder No:	1	2	3	SP	4	5	6		Vertical Plane		Horizontal Plane	
Crank No:	1	2	3	4	5	6	7		x	y	z	w
ENGINE TYPE:												
56SB5												
60SB5												
67LB5	+20	+9	+17	-5	+15	+14		1	+25	-15	+15	-15
70LB5												
725SB5	+24	+10	+19	-13	+18	+16		0.7	+25	-15	+15	-15
67LB6	+21	+9	+18	-7	+18	+10	+18	0.9	+25	-15	+15	-15

- 1) Before calculating A, B, C, D, E, F, & G in Sketch No: 52, the misalignment deflection for the scavenge pump crank must be multiplied by Kc/Ks.

i

TURBO-CHARGED ENGINES.

[illegible]

1.5

1.4

1.3

0

.032"

.042"

0

.016"

.026"

0

.035"

.022"

N.2

N.1

DEFT. EXH

D-TE

MARVIN A. MORGENHAU

DATE ... NEW YORK 10.-11.-67.

WIRE .016" WEIGHT .30 lbs;.....

DRAFT: FWD.13!-.06" AFT.22!-.10"....

.032"

○

DATE... PORT-SUDAN 2.-3.-68

WITH TELESCOPE.

DRAFT: FWD.24!-.00" AFT.29!-.00"

Pistons and connecting rods disconnected
from No 2 cranks.

.017"

○

DATE... PORT-SUDAN 2.-23.-68

WIRE .016" WEIGHT .30 lbs;.....

DRAFT: FWD.14!-.06" AFT.23!-.08"

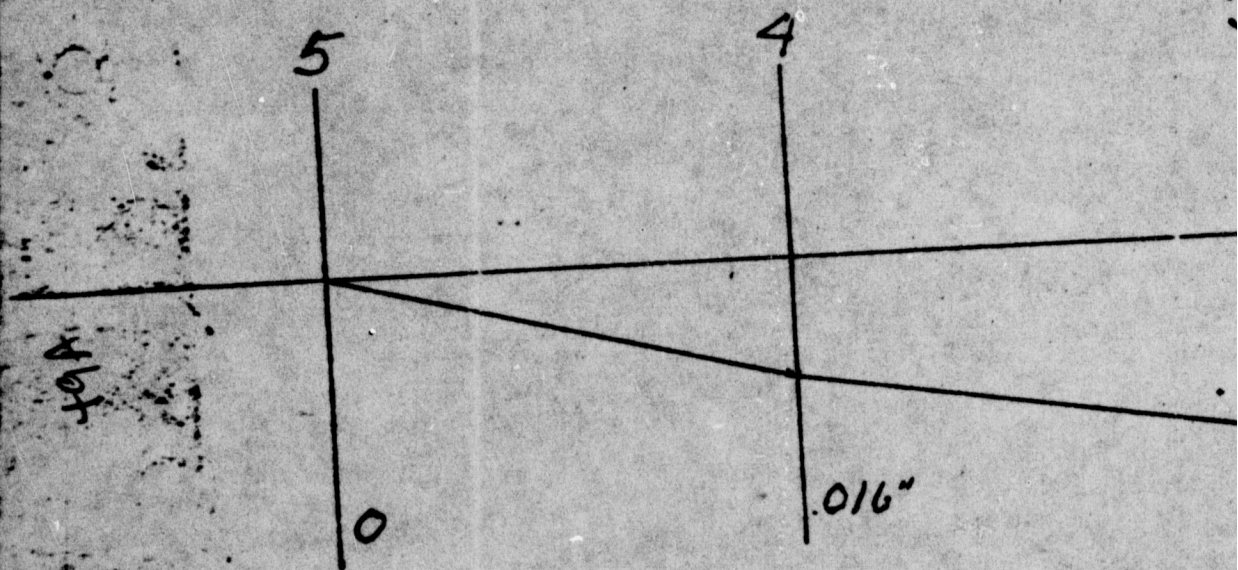
M.E crankshaft alignment checked with
telescope and wire.

.023"

○

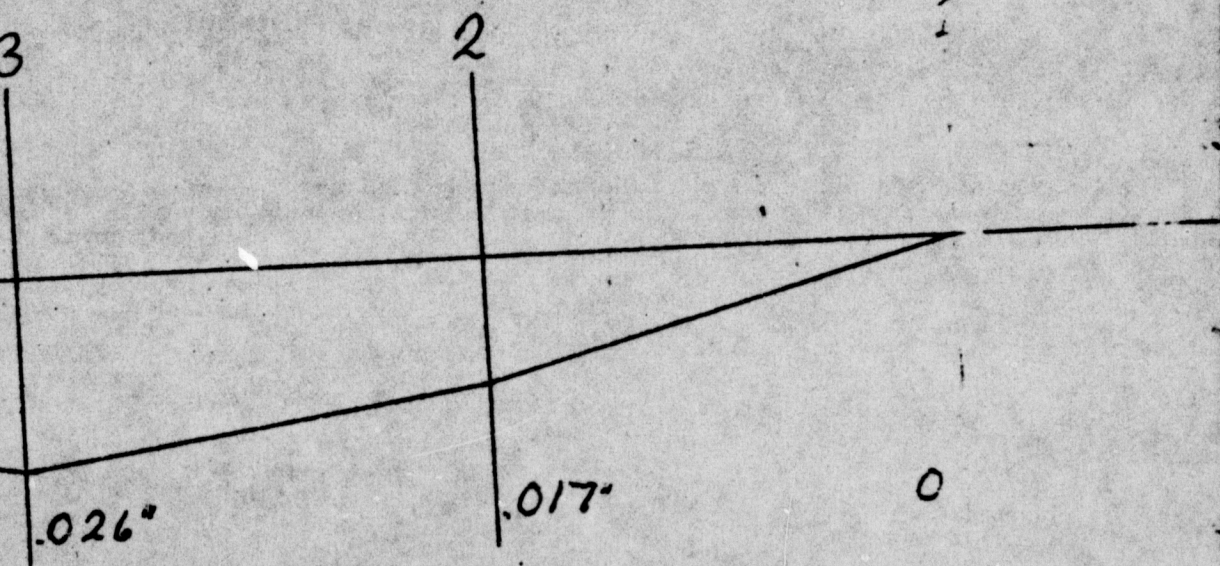
M. Evangelox
Ch. Engineer.

M/S Hellenic Sailor Port Sudan



Crankshaft Position: No. 1

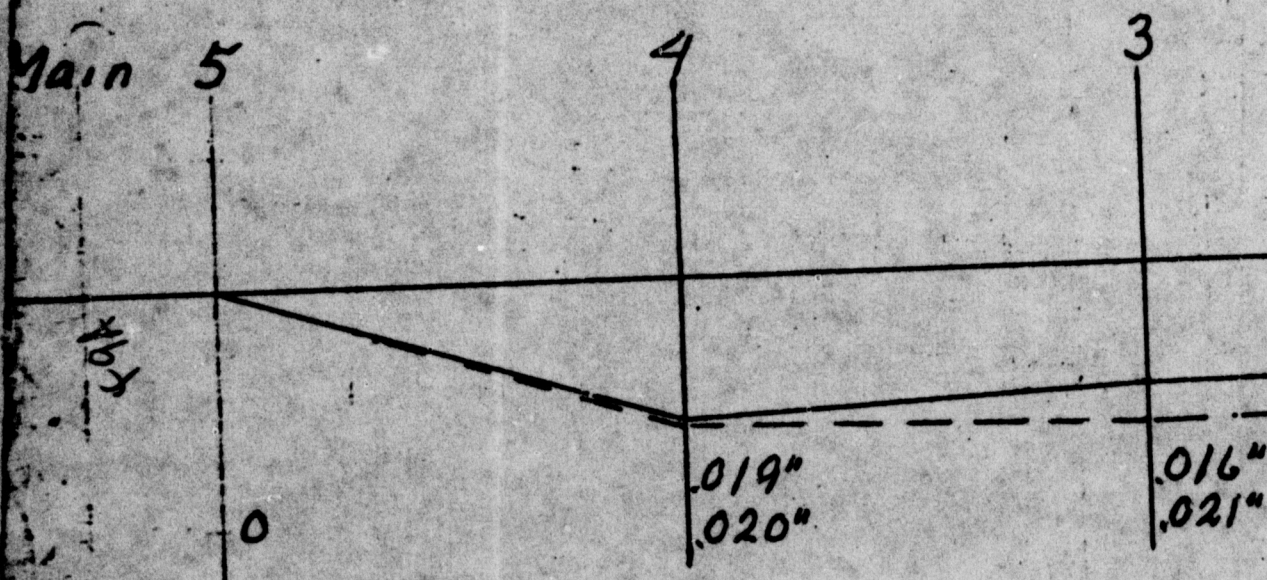
an Feb 3 - 1968



Centre crank 45° BTDC

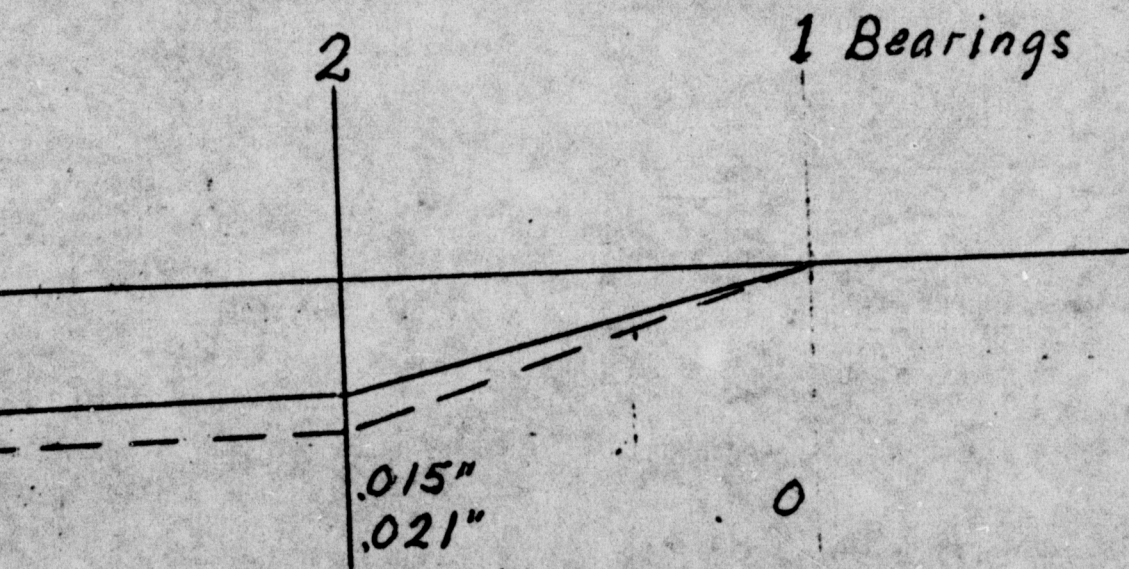
Depth 50
Grind
W 8/23/73

"S Hellenic Sailor" Port Sudan Feb -
M.E. Crankshaft Alignment checked
Pistons and connecting rods disconn
Dotted line reading with shaft pulled d



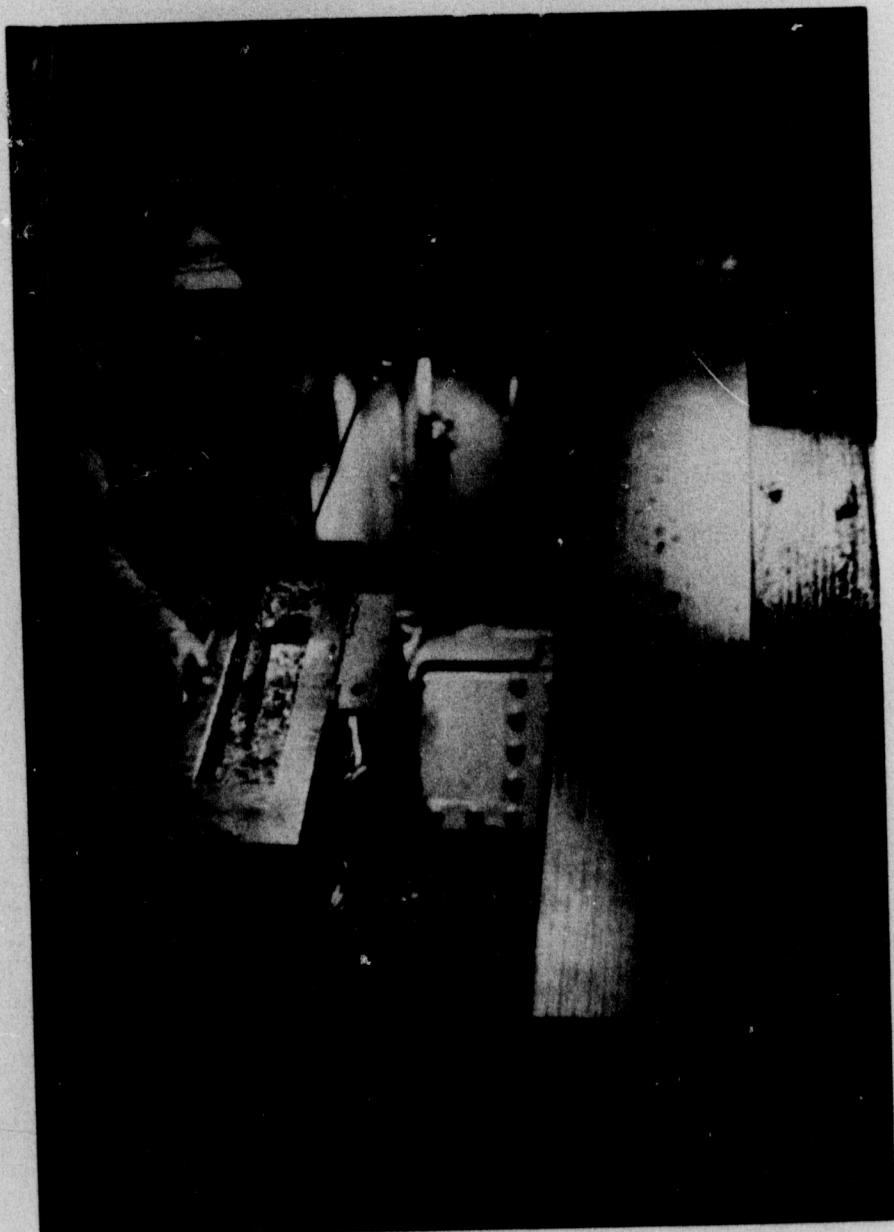
Crankshaft Position: No. 1 Centre

with K+E Transit
ected from No. 2 Cranks
own tight in No's 2 and 3 bearings.

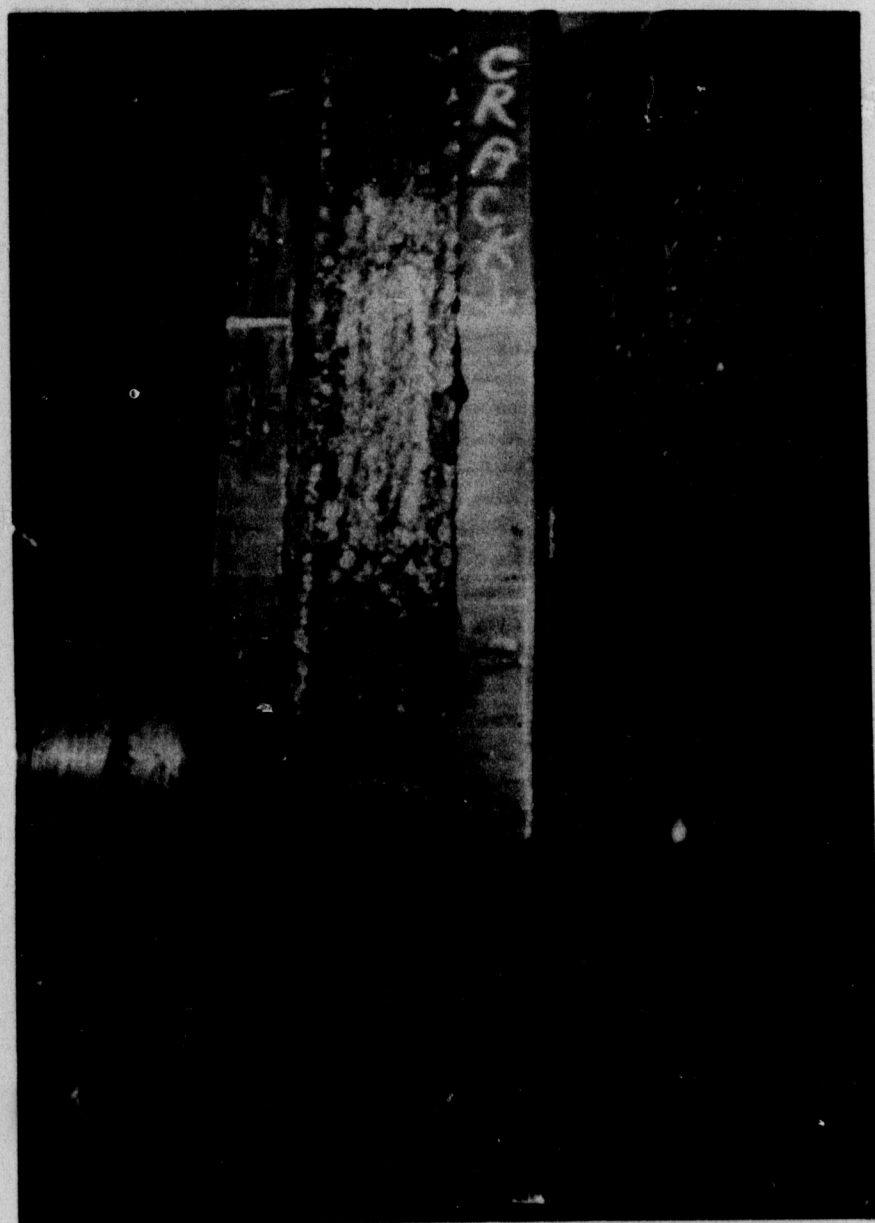


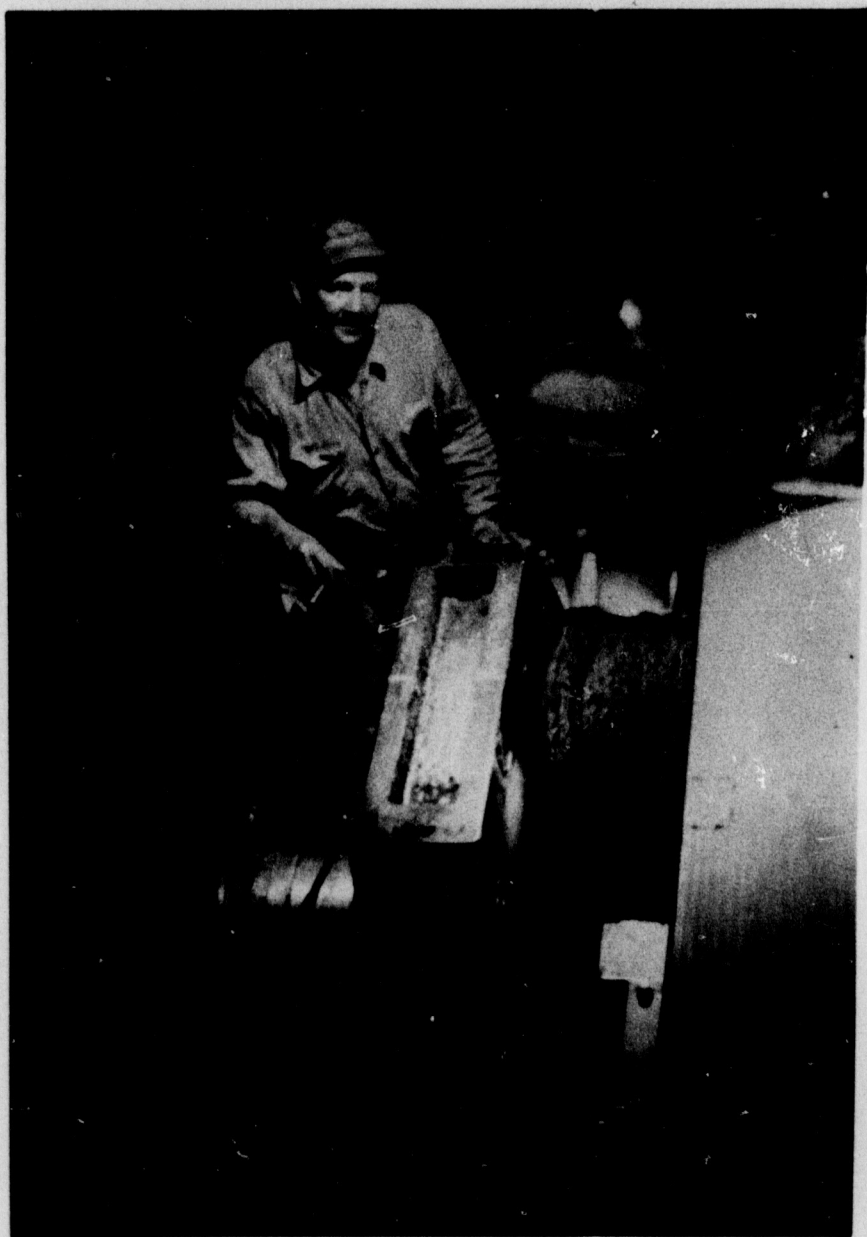
crank 45° BBDC

51-B
Dftr xt ~~51-B~~ finish
WWS 6/23/73







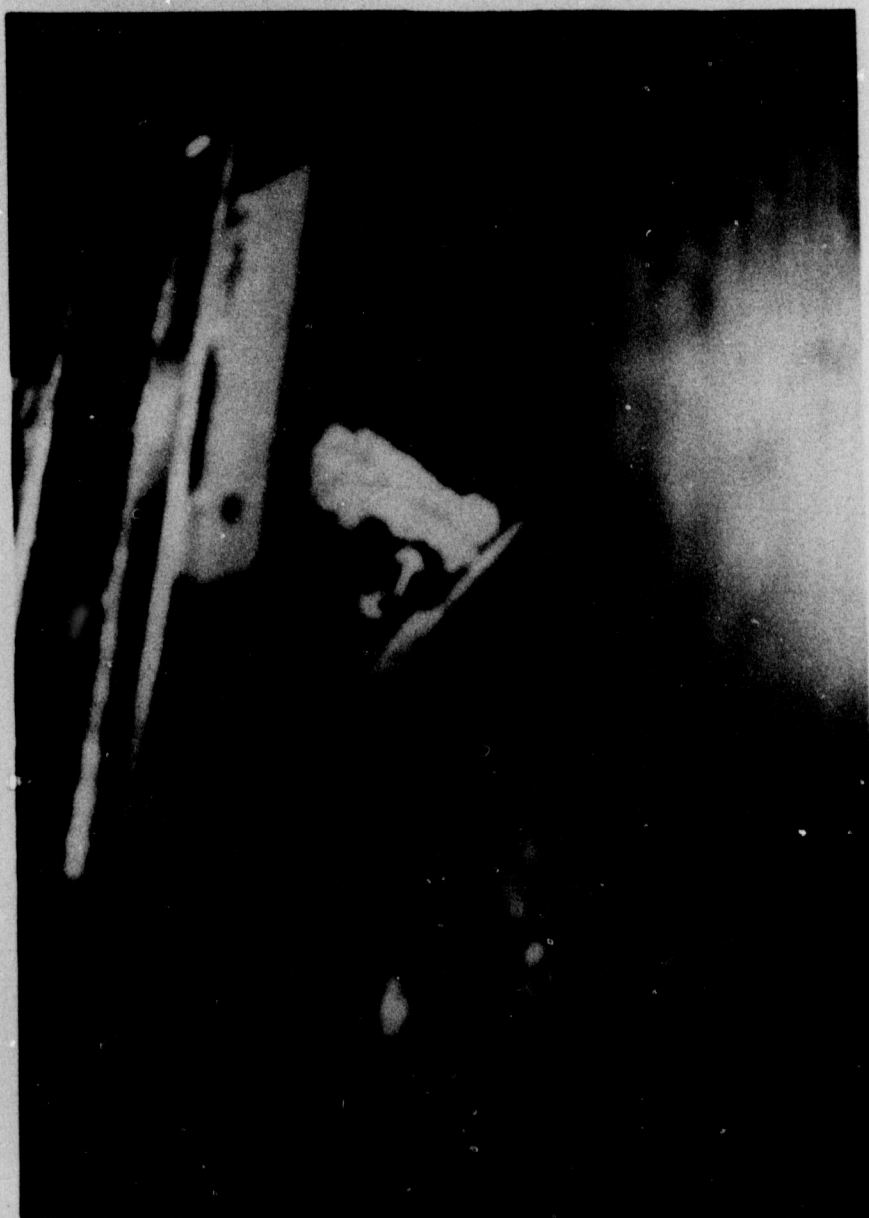


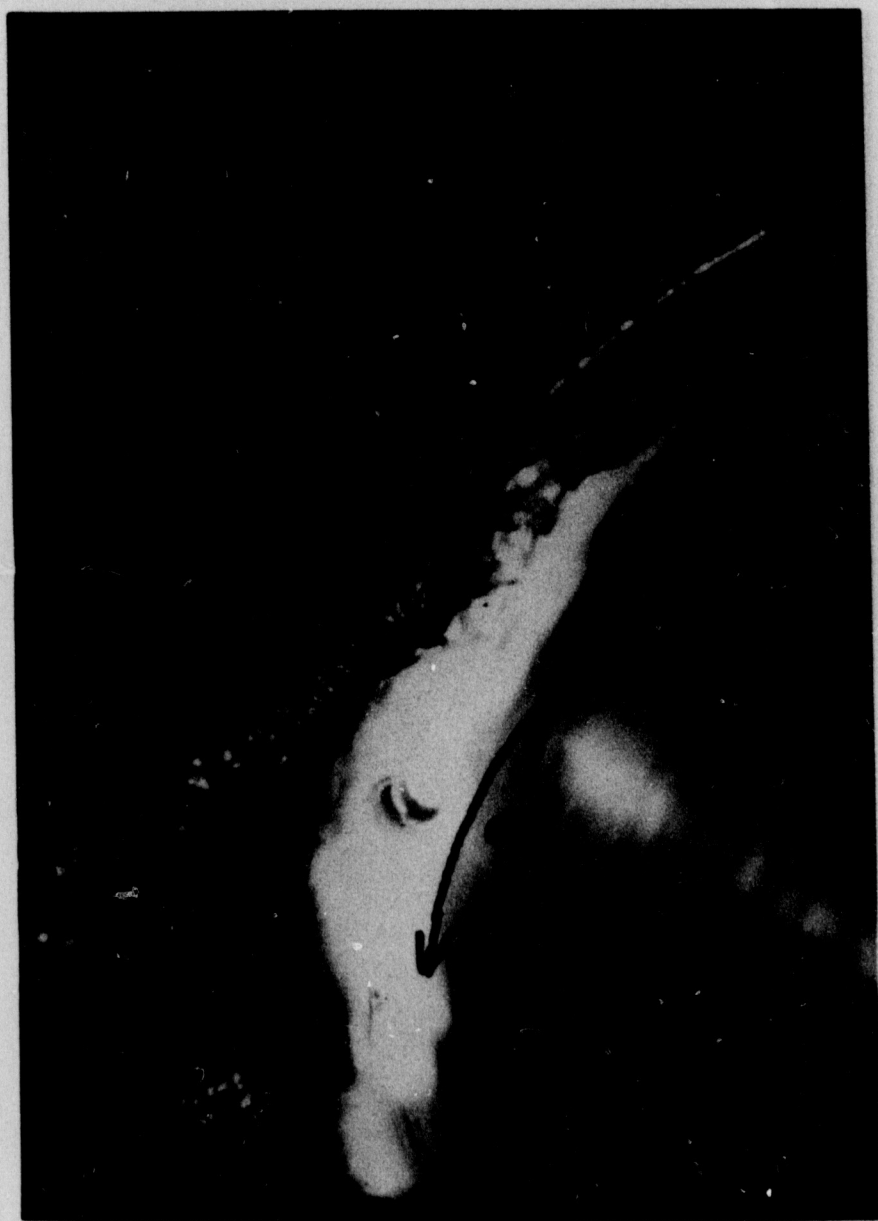


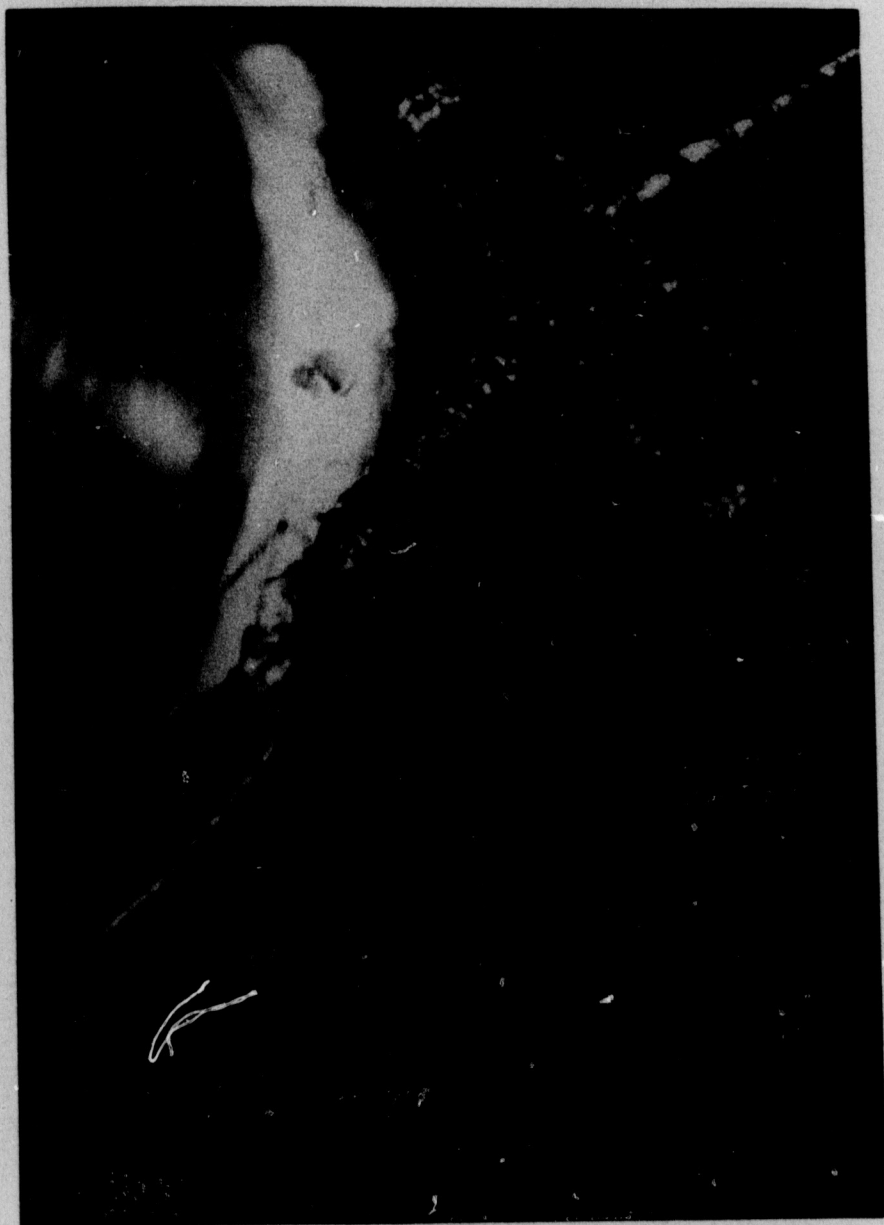


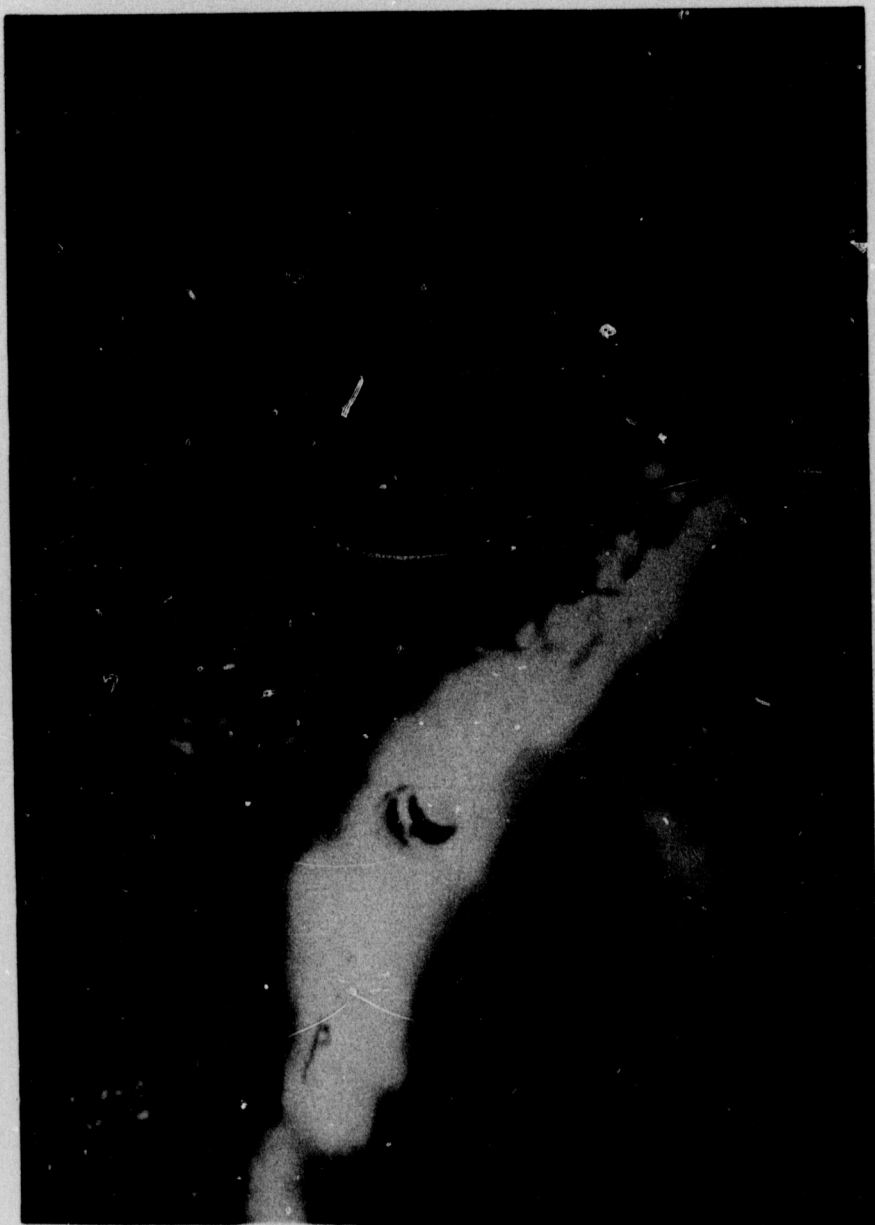






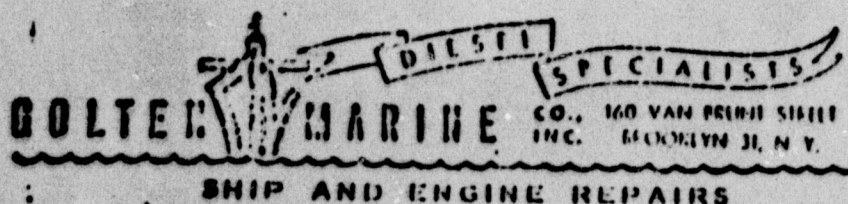






NY 1-10120 B-7200

CABLE ADDRESS "SIGOMACON"



49

TO M/S "HELLENIC SAILOR" & Owners
c/o Hellenic Lines Limited
39 Broadway
New York 6, N. Y.

DATE December 12, 1962

INVOICE NO. 4312

CUST. ORDER NO. B-708

Ed 1652

NET 30 DAYS

Work Perf. OUR ORDER NO. 10/18, 10/19, 10/22-11/13

DESCRIPTION	TOTAL
THE CONDITIONS PRINTED ON REVERSE SIDE ARE PART HEREOF	
ENGINEERING SERVICES	
Furnished services of our Mr. A. Haugestad to attend and supervise the machining etc. of M.E. main bearings #2, 3, 4 and 5 at Sun Shipbuilding & Drydock Co. machine shop, Chester, Pa., October 18th and 19th, 1962, as requested, returning to New York October 20th.	
Engineering service, two days @	\$150.00
Transportation via auto and including parkway tolls and incidentals.	36.00

SERVICES AT PORT SUDAN

Furnished services of Mr. A. Haugestad and two machinists attending vessel at Port Sudan, making necessary preparations to meet exit and entry requirements October 22nd, left New York October 23rd via air, arriving on board vessel October 25th, 1962 and brought special crankshaft reconditioning equipment and instruments to vessel via air freight.

Performed work on Main Engine with Owners engineering superintendent, Mr. C. Allan, attempting to determine causes and correct conditions as found, particularly main bearings, thrust bearing and crosshead bearings.

Upon arrival on board, found main bearings #2, 3, 4 and 5 having been removed to Owners contractors' shop for reconditioning and received final delivery of bearings on board October 28th. In the meantime, work progressed in checking center crosshead bearings in #2 cylinder and making necessary adjustments to bearings and clearances.

Obtained bridge gauge readings, Pilgrim gauge readings and optical distortion detection instruments and corrected conditions at #5 main journal as found required. Checked bottom clearance on thrust. Checked all lube oil inlets for all main bearings and all lube oil outlets from lube oil manifold and found all in order. Removed cap and top half main bearing #1 and found deposit of foreign matter and cleaned away deposit. Covered all lube oil outlet studs with strain material, wire mesh and terry cloth and circulated lube oil for a period of two hours after which elements changed in the Hilco filter and circulated lube oil throughout the night.

Installed #2, 3, 4 and 5 main bearings and checked alignment by optical instruments and found condition good. As indicated by bridge gauge readings, turned out main bearings #2 and #3 in consecutive order, scraped, fitted and reinstalled bearings and obtained readings on conditions. #3 and #4 main journals honed and super-finished.

Readings on alignment taken intermittently, continuously refitting main bearings #2, 3, 4 and 5 and #2 crosshead bearings until conditions found acceptable to begin trial operations of Main Engine for various periods of time, with propeller disengaged and after stopping engine at intervals, opened, checked and adjusted main bearings and crosshead bearings as found required. Engine operated at various rpm for periods of 5 minutes, 10 minutes, 30 minutes, etc. until November 6th, 1962, when the propeller was engaged and vessel left Port Sudan at approx. 2300 clock.

Carried Forward:

\$100.00

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DESCRIPTION	TOTAL
M/S "HELLENIC SAILOR" & Owners - Our Order #B-700 - Inv. #4312 Brought Forward:	\$186.00
During voyage, engine checked at intervals and found in good operating order. After arrival at Djibouti November 9th at 1400 o'clock, opened and checked engine and found all conditions satisfactory for continuous operation. Mr. A. Haugstad and both machinists left Djibouti November 11th via air, arriving at New York November 13th at 2100 o'clock. Engineering services Mr. A. Haugstad and Labor, two machinists	7114.00
Air transportation three men New York-Port Sudan and return Djibouti-New York.	2655.00
Meals and hotel accommodations en-route, three men and incidental expenses for surface transportation, to and from airports, etc.	650.00
Air freight charges for tools and instruments New York-Port Sudan, including forwarders' documentation. (It is understood that these tools and instruments are to be returned to us via Hellenic Lines vessel free of charge.)	415.00
Total:	10220.00
TOTAL: ELEVEN THOUSAND TWENTY-EIGHT DOLLARS.	

App 204 24
12/11/63

REPORT OF MACHINERY SURVEYS AND REPAIRS (Engines and Auxiliaries)
FOR CONSIDERATION BY THE COMMITTEE OF LLOYD'S REGISTER OF SHIPPING

Ship's Name **MS M/V "HELLENIC SAILOR"**

Port **Suez**

Processing Number: LR **514714**

Gross tons **6281**

Rpt. No. **8370**

Port of Registry **Piraeus**

Date of build **1939**

Is there a rpt. of **No**

No. of visits **14**

First date **24/1/68**

Last date **6/2/68**

Interim Cert. issued & copy herewith? **Yes**

Damage rpt. issued and copy herewith? **No**

Last rpt. (H.Q. only) **NYK 66551**

Date of completing rpt. **6/2/68**

Surveyed at, if different from Port above **Port Sudan**

Is a rpt. 9B attached? **No**

MN **-**

Nature of survey **CSM**

Survey fees **£ 125.000**

Damage fee **-**

Expenses **£ 52.845**

S.A. fee **-**

MAIN ENGINES, RECIP., STEAM OR I.C. (State Port—P or Starboard—S)

1 Cyls., covers, pistons, rods, valves & gears **No. 2 Good**

2 Con. rods, crossheads, bearings & guides **Side**

Centre

3 Crankpins (incl. eccentrics) & bearings **Side**

Centre

4 Crankshaft journals & bearings

5 Detuner or vibration damper

MAIN ENGINE DRIVEN SCAVENGE PUMPS AND/OR AIR COMPRESSORS (delete as applicable)

6 Cyls., covers, pistons & rods

7 Con. rods, crossheads, bearings & guides

8 Crankpins & bearings

9 Journals & bearings

10 Levers, links & bearings

11 Coolers & safety devices

12 Scavenge blowers & superchargers

13 Air coolers

14 Crankcase & scavenge doors & explosion relief devices

MAIN TURBINES

15 Casings, rotors, blading, bearings, thrusts & couplings

16 Astern turbine

I declare that the items detailed in this report (except as stated otherwise) comply with the requirements of the Merchant Shipping (Cargo Ship Construction and Survey) Rules 1965, applicable to this ship and are in all respects satisfactory for the service on which the ship is intended to ply, namely, International voyages/voyages within the limits

(The above declaration applies to sea-going cargo ships of 600 tons gross and above registered in the U.K.)

I recommend that the machinery of this ship remain as classed with/without fresh record of **CSM (with date)** upon completion, subject to M.E. crankshaft/in way of No. 2 unit being renewed.

CERTIFIED COPY.

H. P. Seedor
Pro Secretary
LLOYD'S REGISTER
OF SHIPPING.

ALSO FOR
SPL FOR
TRO
GR
POSTING

(Where conditions of class are recommended to be amended, imposed, altered or deleted, particulars must be stated above and on the interim certificate.)

(Copy 1) G. COPY (G.C.L.)
Surveyor to Lloyd's Register of Shipping

(cont'd)

Shafts & wheels

Exhaust steam
turbines (with
recip. eng.)

M.E. steam
compressors

Clutches & hyl.
couplings

De-superheaters

Stop & maneuvering
valves

Main engine
driven pumps
(including fuel injection)

Condensers
(main & aux.)

Have main engines been
examined working &
maneuvering?

Essential independent pumps

Bilge, ballast & oil fuel
suction lines, fittings & controls

Fresh water coolers

Alarms & safety devices including
de-aerator (state service)

Auxiliary air receivers
& safety devices

Main air receivers
& safety devices

Independent air compressors,
coolers & safety devices

Have all evaporators safety
valves been tested under steam?

Steering machinery

18 Shafts, bearings
& couplings

20 Thrust block,
shafts & bearings

22 Intermediate
shafts & bearings

24 Steam re-heaters

26 Forced &/or induced
draught fans

28 Hoisting down
bolts & checks

31 Air ejectors
(main & aux.)

46 Evaporators

48 Windlass

AUXILIARY ENGINES

Thrust block,
shafts & bearings

Intermediate
shafts & bearings

Steam re-heaters

Forced &/or induced
draught fans

Hoisting down
bolts & checks

Air ejectors
(main & aux.)

Evaporators

Windlass

AUXILIARY ENGINES

26 Have the remaining piping arrangements
& fittings in the machinery space been
examined as considered necessary?

37 Lub. oil coolers

38 Pressure feed
water filters

41 Starting air pipes

44 Oil fuel tanks (not
forming part of
the hull structure)

47 Distillers

49 Machinery
spare gear

State
Port P. o
Starboard

Identify
by
position

DOCKING

Sea connections

Oil gland

Propeller

Clearance in stern bush (if relined state clearance before & after)

Seatings & gratings

Date of examining shaft & condition

Has screw/tube shaft been drawn?

Has shaft now fitted been previously used?

Has shaft been changed?

Approved oil gland

Has shaft been examined after a continuous line?

Particulars of defects, repairs, alterations, etc.

Damage to K.E. crankshaft & endeavoured temporary repairs were described in my Port Sudan letter dated 20/1/12.

When a further crack developed in No. 2 journal fillet temporary repairs were stopped & crankshaft section recommended to be renewed.

(Contd.)

State whether continuation sheet attached

The reason for repairs must be stated and those on account of damage, the alleged cause of which must be given, should be detailed separately for each of the repairs. State what action has been taken regarding same which are due to fatigue. State also where appropriate, for the information of the Engineer at the dock, the position of the defect. State whether it is a fatigue crack or whether it is a fatigue crack. State whether it is a fatigue crack or whether it is a fatigue crack. State whether it is a fatigue crack or whether it is a fatigue crack.

9A (cont.)

Ship's Name SS/MS M/V "HELLENIC SAILOR"

Port - Suez

Rpt. No. 8370

(cont'd.)

Crankshaft alignment was checked and readings were satisfactory as shown in attached 2 sheets.

The other 3 sections of crankshaft were dye checked for cracks and found in order.

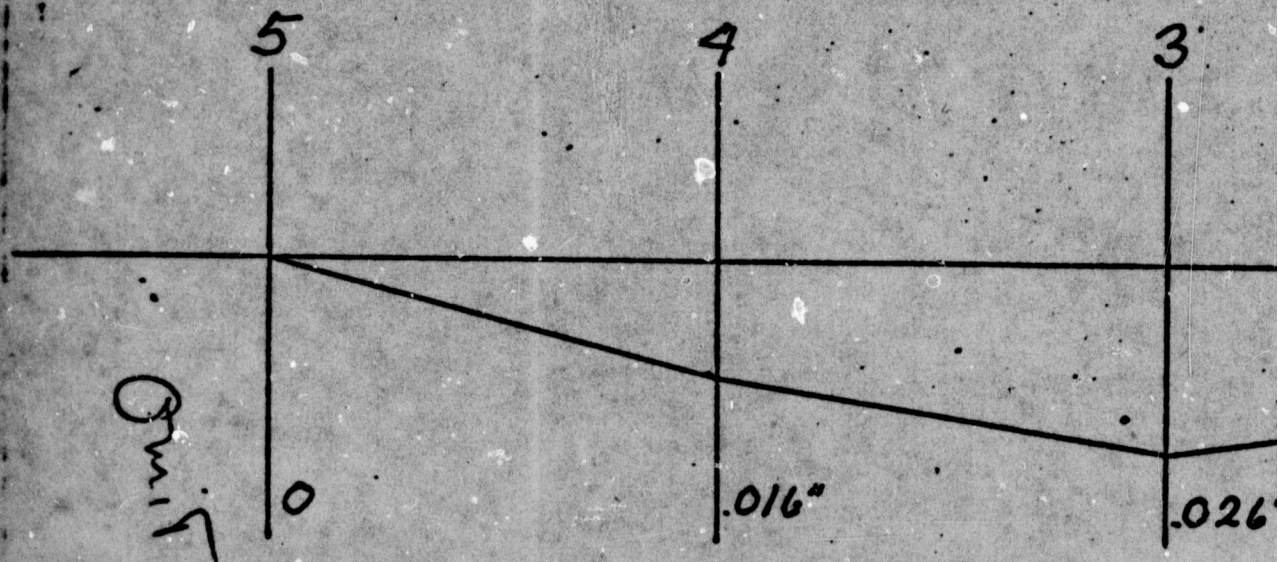
G. Copt

(Signed)

G. Copt
SURVEYOR

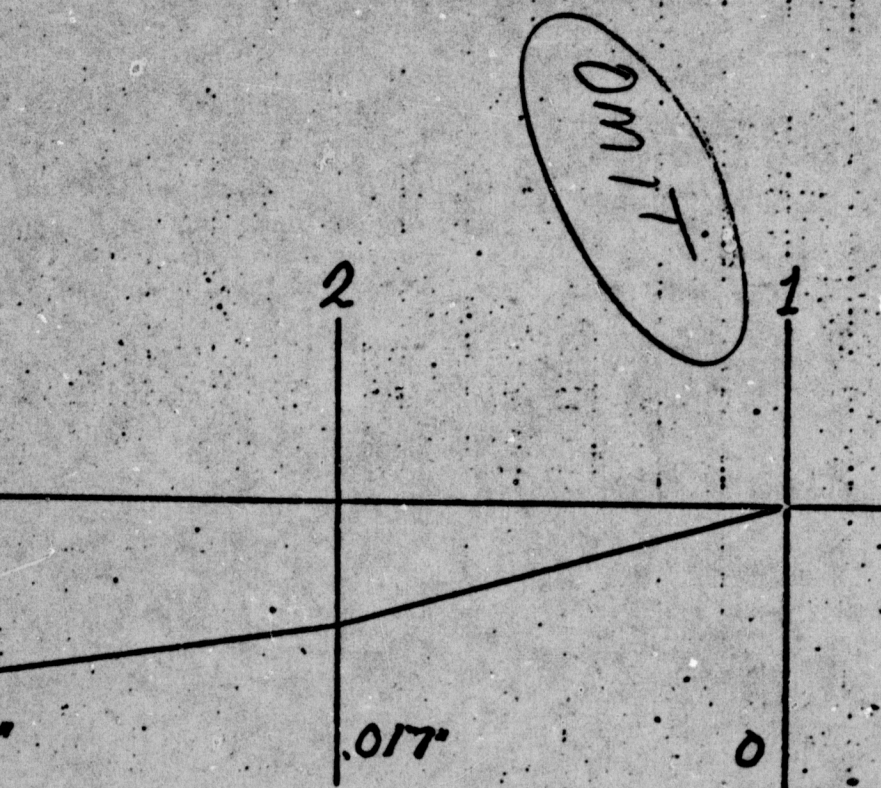
(Adjuster's Note: Sheets showing crankshaft alignment readings are omitted in the interest of economy.)

1/s Hellenic Sailor Port Sudan



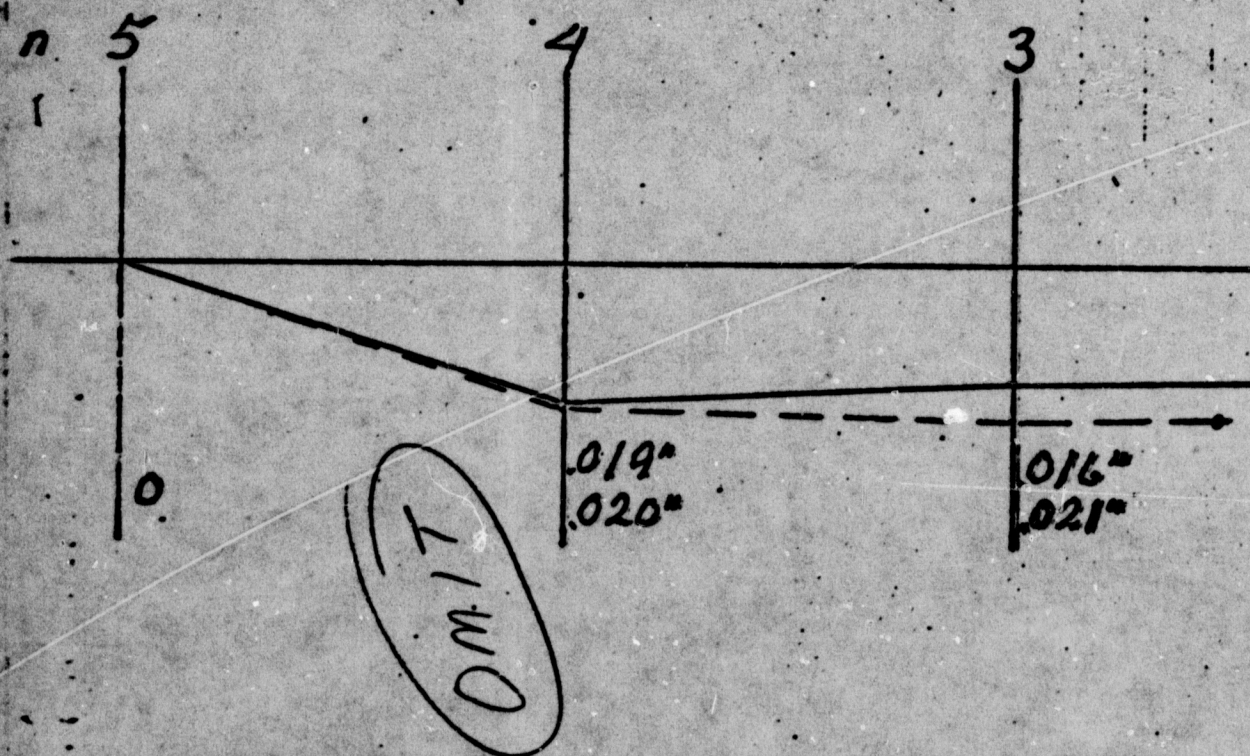
Crankshaft Position: No. 1 Centre

Feb 3 - 1968



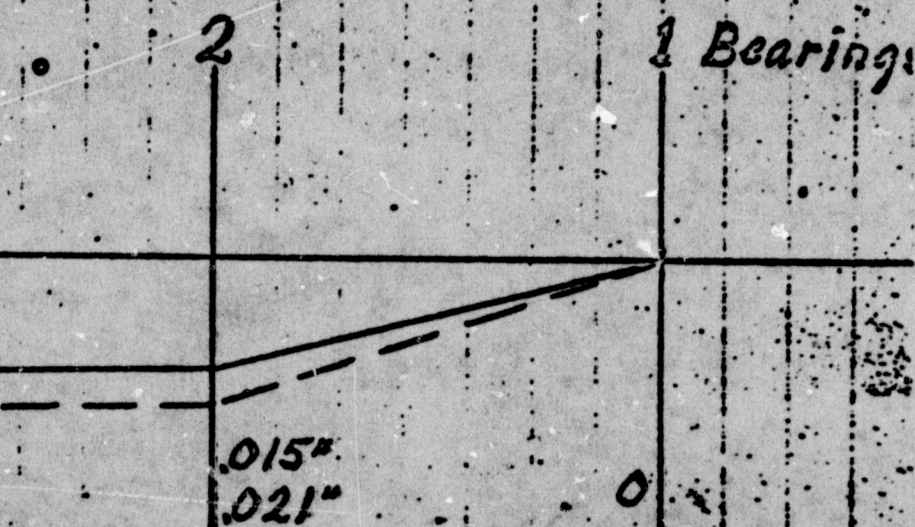
e crank 45° BTDC

M.E. Crankshaft Alignment checked with
Pistons and connecting rods disconnected
Dotted line reading with shaft pulled down



Crankshaft Position: No 1 Centre crank

th K+E Transit
ed from No. 2 Cranks
tight in No's 2 and 3 bearings.



ck 45° BBDC

W
Q

N.5

N.4

N.3

N

0

.032"

.042"

0

.016"

.025"

0

.035"

.022"

2

M.I

DEPT. EXH

FOR ID.

DATE

MARVIN

MORGENSTERN

DATE ... NEW YORK 10.-11.-67.

WIRE: .016" WEIGHT 30 lbs.

DRAFT: FWD. 12!-.06" AFT. 22!-.10"....

.032"

O

DATE... PORT-SUDAN 2.-3.-68

WITH TELESCOPE.

DRAFT: FWD. 24!-.00" AFT. 29!-.00"

Pistons and connecting rods disconnected
from Ks 2 cranks.

.017"

O

DATE... PORT-SUDAN... 2.-23.-68

WIRE: .016" WEIGHT 30 lbs.

DRAFT: FWD. 14!-.06" AFT. 23!-.08"

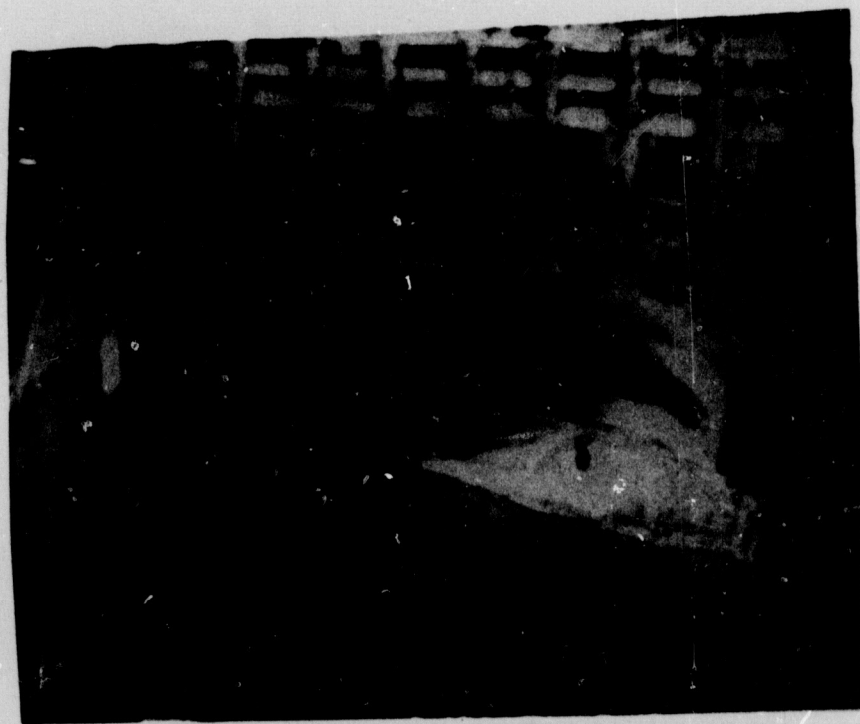
M.E crankshaft alignment checked with
telescope and wire.

.028"

O

Original
PEC
#6

M. Evangelou
Ch. Engineer.



PHONE ULSTER 9-7210

CABLE ADDRESS "SIGOMACLIN"



49

D TO M/S "HELLENIC SAILOR" & Owners
c/o Hellenic Lines Limited
39 Broadway
New York 6, N. Y.

DATE October 5, 1962

INVOICE NO. 4072

CUST. ORDER NO.

B-637

OUR ORDER NO. 9/10 - 9/24/62
WORK PERFORMED

15: NET 30 DAYS

Ed 1653

DESCRIPTION

TOTAL

THE CONDITIONS PRINTED ON REVERSE SIDE ARE PART HEREOF

ENGINEERING SERVICES

As requested, furnished services of our Mr. A. Haugestad, with necessary instruments, to attend vessel at Piraeus, Greece, working with Owners' engineering superintendent, Mr. C. Allen, in correcting existing misalignment of crankshaft, main bearings, thrust bearings and crosshead bearings on Sun Doxford 4-cylinder main propulsion engine.

Optical distortion detection instruments, string gauge, bridge gauge and Pilgrim gauge equipment used during the adjustments, shifting and re-alignment of the various bearings, the alignments partially accomplished by rebabbitting and boring of bearings as requirements indicated by instruments until all of the components properly aligned, with crankshaft properly resting in main and thrust bearings and crosshead pins and bearings correspondingly adjusted.

Conditions as found upon arrival on board recorded and result of readings upon completion of work recorded and charts of results of findings furnished.

Trial operations of engine with propeller disengaged started Sept. 19th at 05:35 o'clock. Engine operated 15 minutes at 35 rpm after which engine stopped and opened for inspection. Conditions found satisfactory and engine again started and operated for a period of 30 minutes at 45 rpm and afterwards stopped for inspection.

No. 2 center crosshead found to require and performed necessary adjustments, pins polished and bearings refitted.

Trial operations and adjustments continued on Sept. 20th and 21st operating engine for intermittent periods of time at various rpm making adjustments as found necessary until engine operated from 02:30 o'clock Sept. 22nd for a period of 3 1/2 hrs. at 85 rpm and all conditions were found satisfactory to all concerned. Propeller connected and engine made ready for departure on sea trial.

Stand by ordered on Sept. 22nd at 12:58 o'clock and trial with various maneuverings started at 13:05 o'clock continuing to 13:22 o'clock at 45 rpm for a period of 30 minutes after which engine stopped, conditions checked and found satisfactory. Sea trial continued from 13:56 o'clock for one hour at 69 rpm, engine stopped, conditions checked and found good. Engine started at 15:10 o'clock and operated one hour at 82 rpm, stopped, checked and found condition satisfactory.

Sea trial continued at 16:40 o'clock and operated at 82 rpm, slowing down at 19:15 o'clock and came to a full stop at 19:35 o'clock at which time engine opened, all bearings checked found all in good condition and found clearance in No. 2 center crosshead correct, remaining as per prior final adjustment. Landed from vessel at 24:00 o'clock.

Engineering services, 15 days at

\$1125.00

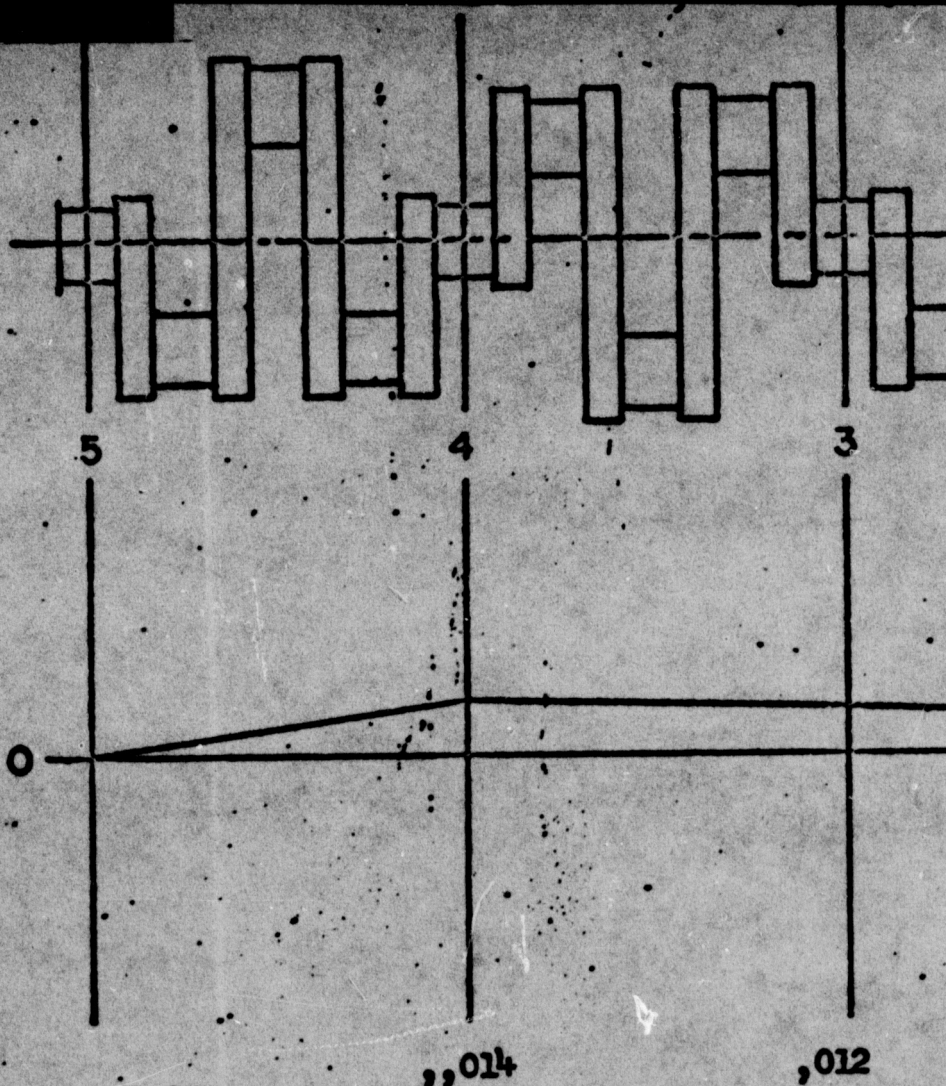
Carried Forward:

\$1125.00

Def/84 33 for 11
4/21/13 H/

DESCRIPTION	TOTAL
M/S "HELLENIC SAILOR" & Owners - Our Order #B-637 - Inv. #4072 Brought Forward:	\$1125.00
Hotel accommodations, meals, taxi transportation to and from airports and incidental disbursements.	148.00
Air transportation costs for Mr. A. Haugestad assumed by Owners except excess baggage air charges for instruments. Excess baggage charges.	159.00
Total:	<u>\$1432.00</u>
TOTAL: ONE THOUSAND FOUR HUNDRED THIRTY-TWO DOLLARS.	

App Vay 24
2/11/63



,,014

,012

No. 1 Center Crank 45° after T.

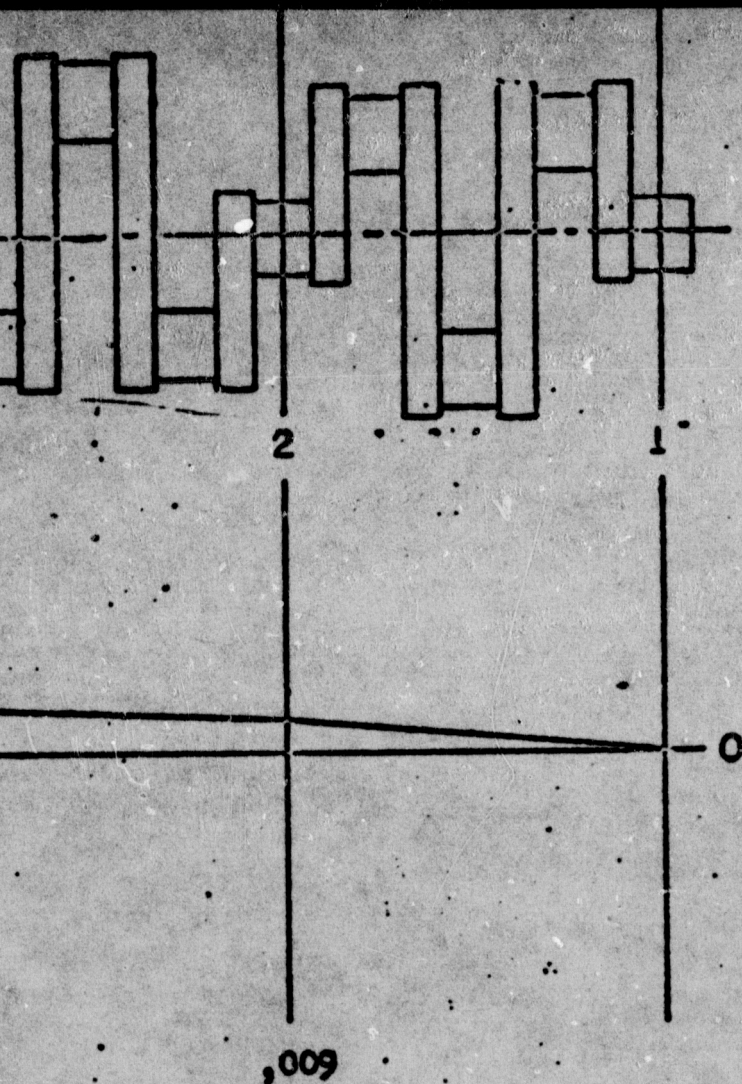
U/V "Hellenic Sailor"

DATE: Sept. 17. - 62

DRAFT:

FWD.: 24' - 00

AFT: 26' - 00



,009

D.C.

TELESCOPE READINGS ALONG
CRANKSHAFT ON DOXFORD ENGINE

GOLTEN MARINE CO., INC.

*Defls 0.034 for 11
8.1.12.12.12.12*